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United States Department of Energy

Environmental Assessment of Remedial Action at the Gunnison Uranium Mill Tailings Site Near Gunnison, Colorado

Final

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Uranium Mill Tailings Remedial Action Project

DISCLAIMER

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ENVIRONMENTAL ASSESSMENT
OF
REMEDIAL ACTION AT THE
GUNNISON URANIUM MILL TAILINGS SITE
GUNNISON, COLORADO

FEBRUARY 1992

U.S. Department of Energy
UMTRA Project Office
Albuquerque, New Mexico

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1.0 SUMMARY

The Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA) authorized the U.S. Department of Energy (DOE) to clean up the Gunnison, Colorado, uranium mill tailings processing site to reduce the potential health effects associated with the radioactive materials remaining on the site and on 11 vicinity properties associated with the site. The U.S. Environmental Protection Agency (EPA) promulgated standards for the UMTRCA that contained measures to control the contaminated materials and to protect the groundwater from further degradation. Remedial actions at the Gunnison site must be performed in accordance with these standards and with the concurrence of the U.S. Nuclear Regulatory Commission (NRC).

Contaminated materials at the Gunnison processing site cover an estimated 60.5 acres at the designated site and an additional 7.5 acres on adjacent properties. Contaminated areas include a tailings pile, subsurface contamination, windblown contamination, and miscellaneous areas that have been contaminated by uranium processing activities. In addition to the contamination in the processing site area, 11 properties off of the site (vicinity properties) were found to contain contamination. The contaminated materials from the vicinity properties are being stored on the processing site. The total volume of contaminated materials is estimated at 718,900 cubic yards. Contamination associated with the processing site has leached into the groundwater and is currently affecting the water quality of 22 residences hydrologically downgradient from the tailings pile.

The proposed action for remediation of the Gunnison processing site consists of removing all contaminated materials found within the designated site boundary or associated with the processing site and stabilizing them at a remote location approximately six air miles east of the processing site and the city of Gunnison. The contaminated materials would be partially buried and covered with layers of rock and soil. The proposed disposal site is on land administered by the Bureau of Land Management (BLM); the general area is used by cattle for grazing six weeks each year. An estimated 92 acres for the disposal site would be permanently transferred from the BLM to the DOE and restricted from future uses.

The proposed transportation route from the processing site to the disposal site crosses land primarily administered by the BLM. An existing primitive track would be upgraded and improved for use by trucks hauling the contaminated materials. Approximately one mile of the route would parallel an existing county road.

Adverse environmental impacts associated with the proposed action include noise impacts to the residents of a small subdivision who live near the proposed haul route; the unavoidable destruction of a small population of the Gunnison milkvetch, a Federal candidate plant species growing on the tailings pile; the loss of wetlands, which would be mitigated; possible impacts to a recently transplanted antelope herd and sage grouse use areas; the temporary and permanent loss of an estimated 92 acres of open range for grazing and wildlife use; and a "may affect" determination on the Colorado squawfish, humpback chub, bonytail chub, and razorback sucker from the project's use of water from the Colorado River Basin.

Direct and indirect impacts to resident wildlife may include road mortalities and the impacts associated with the loss of cover and food during the remedial action and recovery period. Means to mitigate these adverse environmental impacts of the proposed action are discussed in Section 6.0 of this EA.

Positive impacts are associated with a reduction in potential health effects related to the contaminated uranium mill tailings; the future availability of the currently contaminated processing site area for more productive uses; and increases in local expenditures and employment related to the remedial action.

For more information contact:

Albert Chernoff
UMTRA Project Manager
U.S. Department of Energy
UMTRA Project Office
5301 Central Ave. NE, Suite 1720
Albuquerque, New Mexico 87108
505/845-4628

2.0 INTRODUCTION

2.1 BACKGROUND

In response to concern over the potental public health hazards related to uranium mill tailings and the associated contaminated materials left abandoned or otherwise uncontrolled at inactive processing sites throughout the United States, Congress enacted Public Law 95-604, the UMTRCA, on November 8, 1978. In the UMTRCA, Congress acknowledged that potential health hazards are associated with uranium mill tailings and identified a number of sites that were in need of remedial actions. The Gunnison processing site is one of these sites.

Uranium mill tailings materials are the residues of uranium ore processing operations and consist of finely ground rock, similar to sand. The principal potential hazard associated with the tailings results from the production of radon, a radioactive gas formed from the radioactive decay of the radium contained within the tailings. Radon can move through the tailings into the air. Increased exposure to radon and its decay products over a long period of time increases the probability that health effects (i.e., cancers) may develop in persons living and working near the tailings. Another hazard is associated with radioactive and other hazardous elements in the tailings leaching out of the tailings and through the underlying soils and contaminating groundwater.

Exposure to gamma radiation, the inhalation and ingestion of airborne radioactive particulates, the ingestion of contaminated food grown in contaminated soil in areas around the tailings, and the ingestion of surface and ground waters contaminated by the tailings also pose potential hazards. If the tailings and associated contaminated materials are not properly stabilized, natural processes such as wind and water erosion or removal of the materials by people could spread the contamination and increase the potential for public health hazards.

To protect public health, the EPA promulgated the standards for remedial actions under the UMTRCA in 40 CFR Part 192.

On September 3, 1985, the U.S. Tenth Circuit Court of Appeals remanded the EPA groundwater standards portion of 40 CFR Part 192 (40 CFR 192.20 (a)(2) and (3)). The EPA subsequently proposed new groundwater standards that, although not final at the time of this writing, are nonetheless applicable to the remedial action at the Gunnison site. Compliance with the proposed standards will be evaluated in this EA; however, analysis of the need for groundwater restoration at the processing site will be evaluated after the proposed EPA groundwater standards are final as part of a separate National Environmental Policy Act (NEPA) process.

2.2 DESCRIPTION OF THE PROCESSING AND DISPOSAL SITES

Processing site

The Gunnison processing site is located adjacent to the city of Gunnison in Gunnison County, Colorado, on a drainage divide between the

Gunnison River and Tomichi Creek in the Gunnison River valley (Figure 2.1). The tailings pile is bounded on the north and east by Gold Basin Road and the Gunnison County Airport runways. An operating gravel pit and a concrete batch plant are south of the designated site. The land immediately west of the tailings pile is residential and commercial. Farther west (within 1.5 miles and downgradient of the tailings pile) is a small subdivision with approximately 108 residences on small acreages with a golf course and open space areas. All of the residences and commercial properties use domestic water wells for potable water. The nearest residence is approximately 100 feet west of the processing site boundary (Figure 2.2).

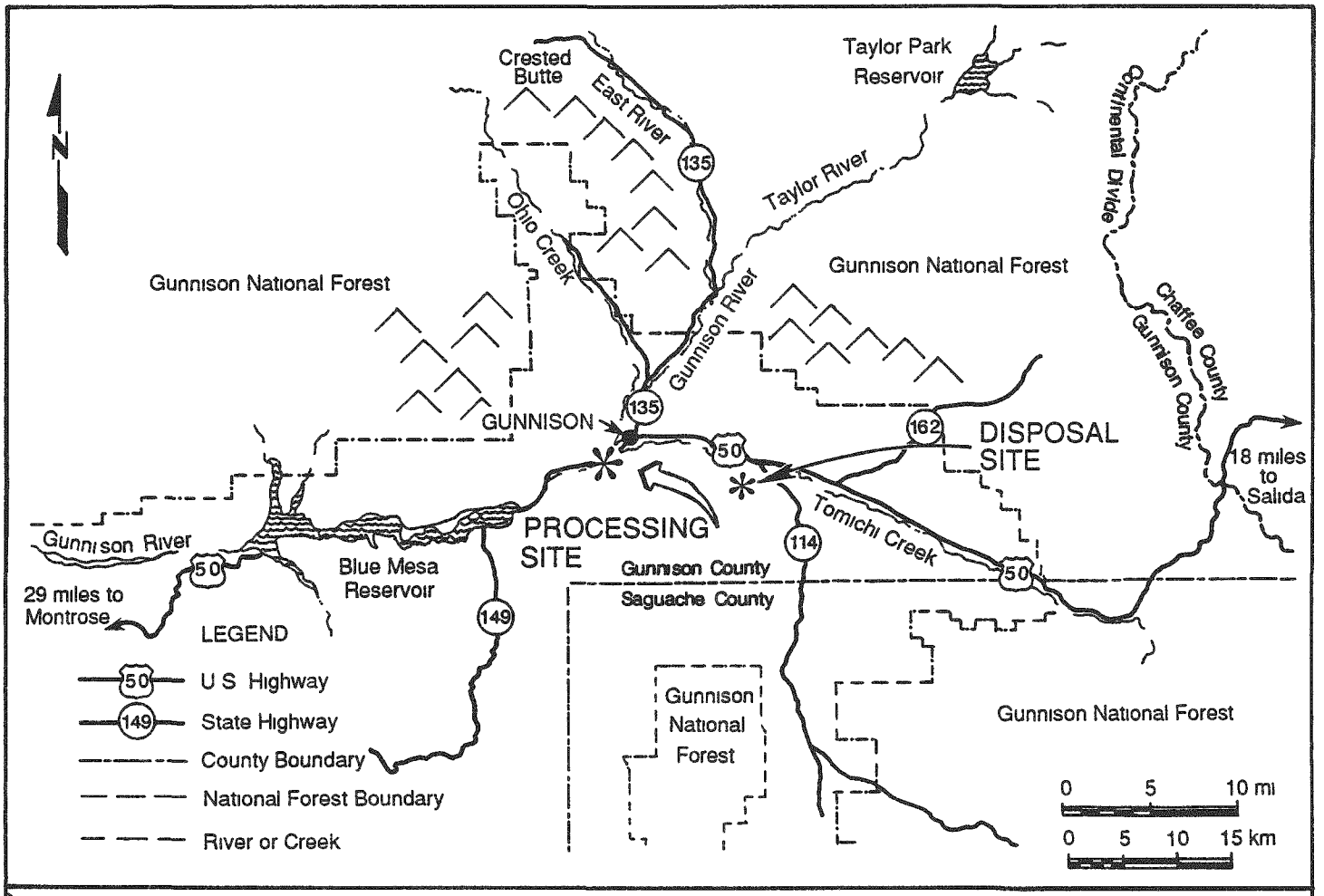
The mill was constructed in the late 1950s to produce uranium to sell to the Atomic Energy Commission (predecessor to the DOE), and was operated from 1958 until April 1962. Ore was trucked to the mill from mines in the Cochetopa Pass area, about 25 miles southeast of Gunnison. The mill had a capacity of 200 tons of ore per day. The ore was ground and then leached with sulfuric acid and sodium chlorate. After leaching, the uranium-rich solutions and waste solids were separated by a four-stage countercurrent classifier and thickener circuit. The uranium solutions were then treated by solvent extraction to concentrate and recover the uranium; the solids were dumped in what became the tailings pile. During its four years of operation, the mill processed about 540,000 dry tons of ore with an average grade of 0.15 percent uranium oxide (FBDU, 1981).

The designated site covers 60.5 acres; approximately 35 acres are occupied by the rectangularly shaped tailings pile and approximately 16 acres are contaminated and occupied by mill structures, the former ore storage area, and miscellaneous areas. Windblown contaminated areas within and adjacent to the designated site occupy an additional 17 acres. The tailings pile averages 9.9 feet in thickness and contains approximately 459,000 cubic yards (cy) of tailings. The total volume of contaminated materials, including the tailings, windblown, mill yard, ore storage, miscellaneous contaminated areas and materials, and debris from vicinity properties, is estimated at 718,900 cy. Contamination is spread over an estimated 68 acres.

Demolition of all site buildings and structures was completed during 1991. The rubble from the structures remains on site and would be permanently disposed of with the other contaminated materials and tailings. The designated site is secured by a five-strand barbed wire fence that is posted with radiation warning signs. The tailings pile has been contoured, covered with 0.5 foot of material from a nearby gravel pit, and vegetated with a mixture of grasses. The vegetation is sustained by natural precipitation. The top of the pile has a sparse cover of vegetation and is currently exhibiting some sheet and rill erosion and minor gullying. The steeper sideslopes are not as well covered with vegetation and also show evidence of gullying.

Elevated levels of net gross alpha activity, arsenic, cadmium, chromium, molybdenum, selenium, and uranium were found in groundwater samples taken immediately downgradient of the tailings pile; these levels exceed the proposed EPA groundwater protection standards (DOE, 1990a).

The results of domestic water well sampling during July and October of 1990 show that 22 domestic water wells downgradient of the processing site



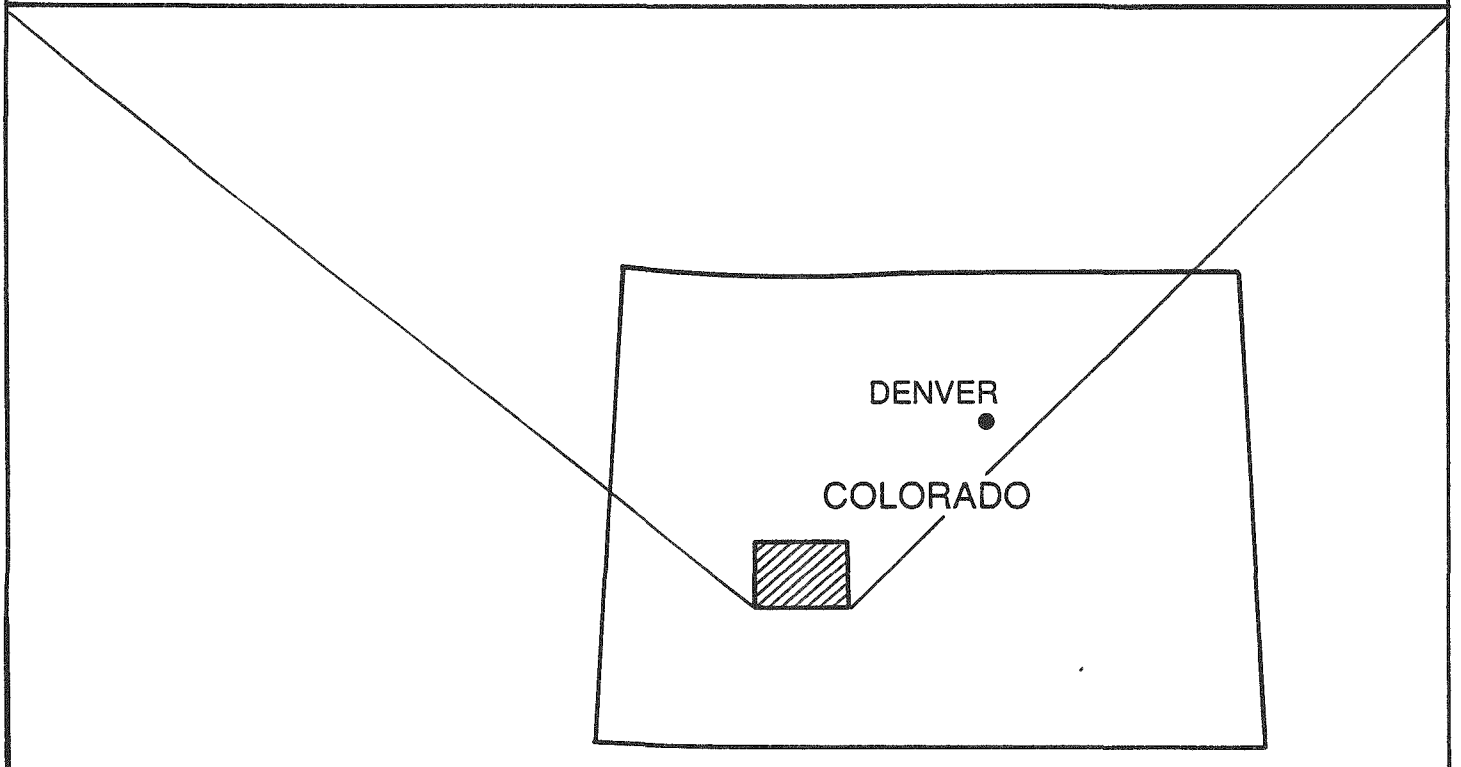


FIGURE 2.1
GUNNISON SITE LOCATION MAP, COLORADO

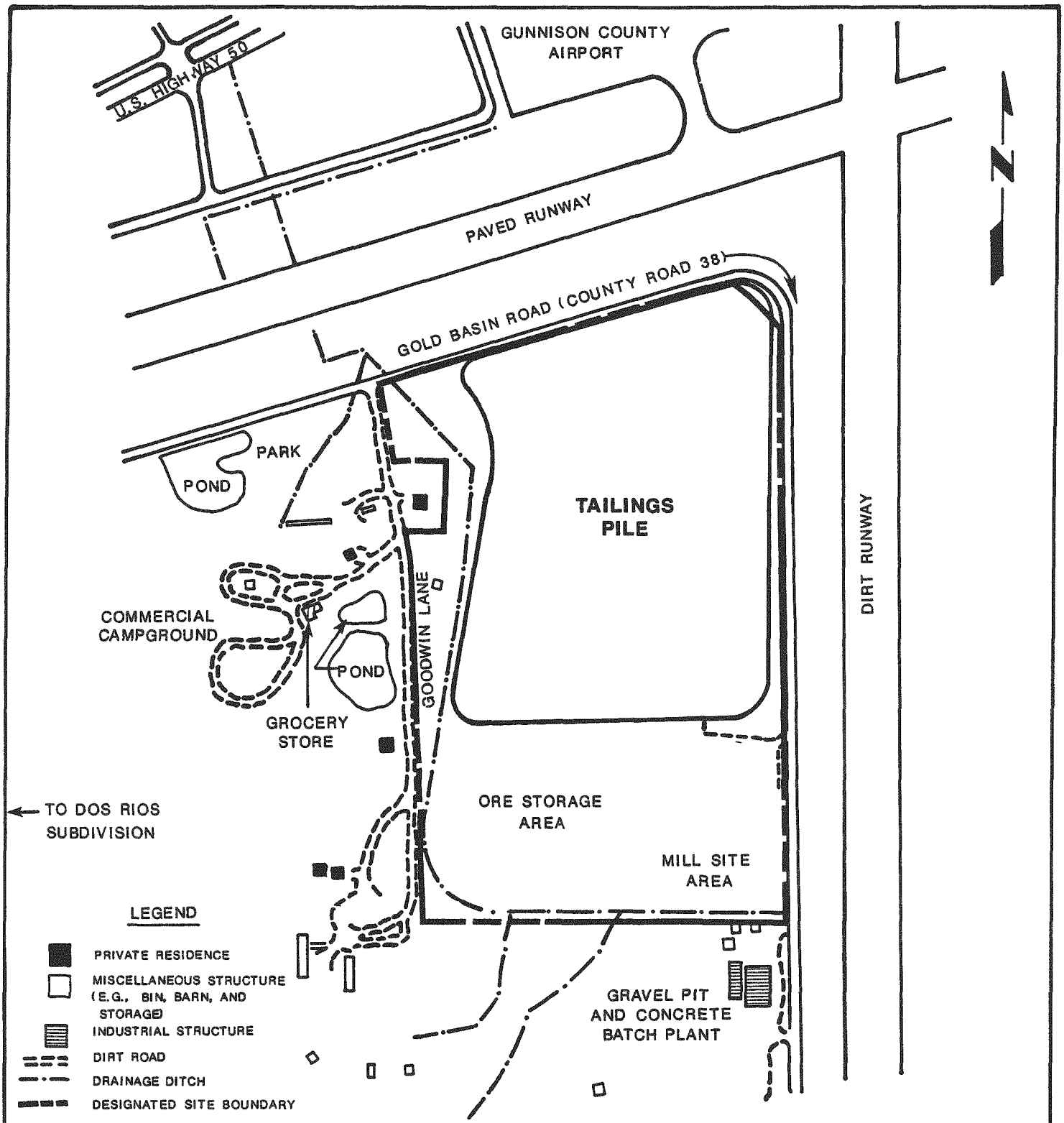


FIGURE 2.2

LAND USE IN THE VICINITY OF THE

GUNNISON PROCESSING SITE NEAR GUNNISON, COLORADO

have elevated levels of uranium that exceed background levels (0.008 milligrams per liter (mg/l)), which are the maximum observed natural concentrations for the region. Several of these wells also exceed the proposed EPA health advisory level for uranium of 0.030 mg/l or the proposed maximum concentration limit in Table A of 40 CFR 192 of 0.044 mg/l. Other metals, including manganese, cadmium, and the uranium decay product lead-210, have also been detected at levels significantly above background. Thorium-230, radium-226, radium-222, and other uranium decay products have been detected at levels consistent with the regional background levels. In September, 1990, based on the results of a baseline risk assessment for groundwater contamination (DOE, 1990a), the DOE began providing bottled water to all downgradient users, including the entire Dos Rios subdivision, as a public health measure. The bottled water was intended to provide emergency relief to those residents with contaminated water wells and to allow time for an evaluation of a permanent solution. The DOE evaluated the provision of a permanent uncontaminated water supply system in an environmental assessment (EA), which was approved in 1991 (DOE, 1991). The DOE anticipates that construction of a water supply system will begin in 1992 and that all affected residences or commercial establishments will be connected to the water supply system in 1994.

Disposal site

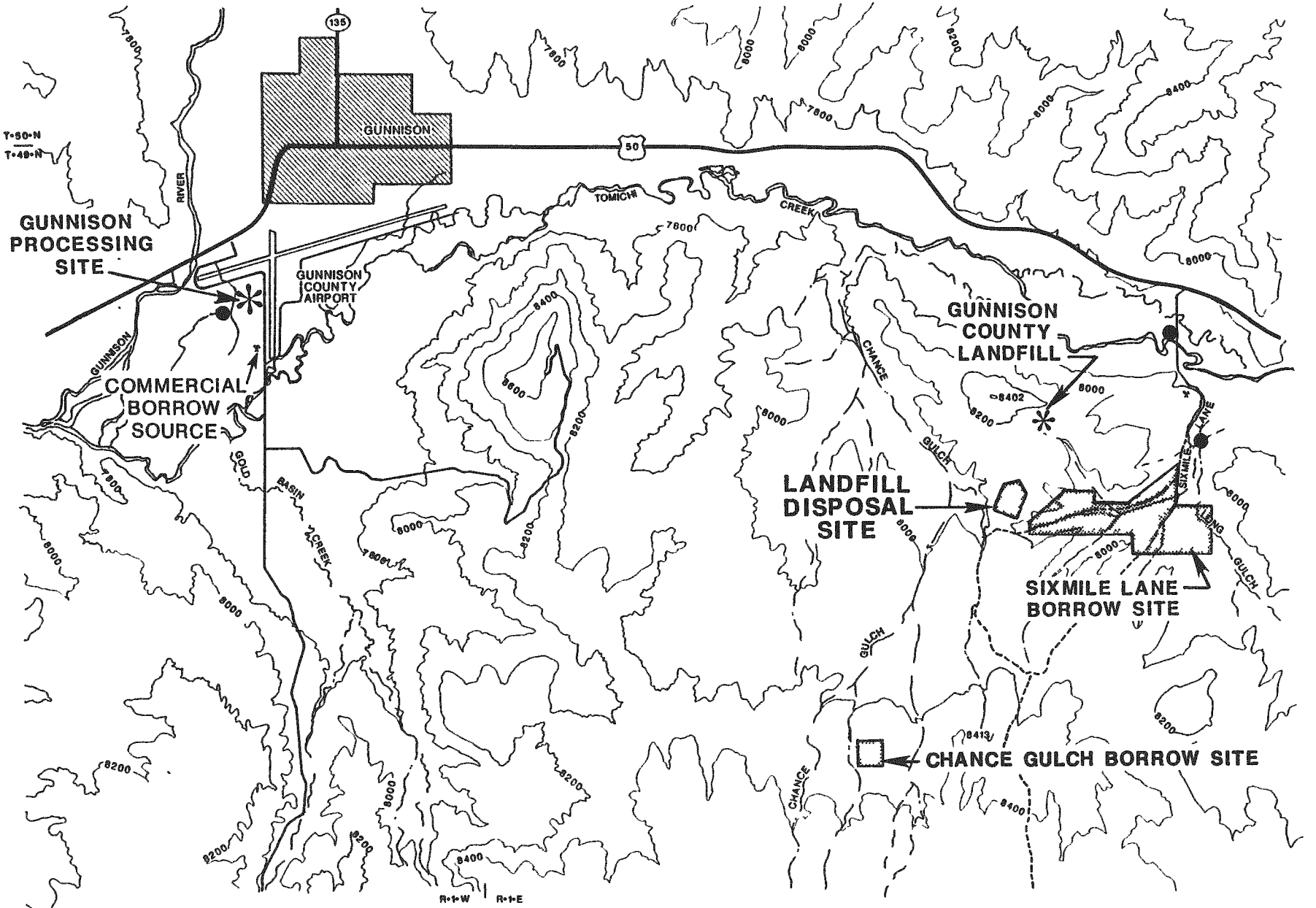
The proposed disposal site, called the Landfill disposal site, is located in a gently sloping, bowl-shaped area near the head of two ephemeral drainages approximately six air miles from the processing site. The area is used by cattle for grazing six weeks of the year and is considered important wildlife habitat for sage grouse and antelope by the BLM and the Colorado Division of Wildlife (CDOW). The Gunnison County landfill is about 2000 feet northeast of the disposal site. The area surrounding the disposal site is under BLM administration and is similarly used for grazing and by wildlife. There are two occupied residences within three miles of the disposal site (Figure 2.3). See Section 4.7, Land Use, for additional detail.

2.3 ISSUES OF CONCERN

The presence of contaminated uranium mill tailings adjacent to the city of Gunnison has been a local concern for many years. The following issues were identified by Gunnison County, the BLM, and the CDOW during public meetings that were held by the DOE prior to distribution of an earlier version of this EA. Many of these issues will require mitigation.

- Groundwater contamination is of concern to residents of a nearby subdivision. An estimated 22 residential wells have tested positive for uranium contamination (DOE, 1991). The DOE anticipates construction of a permanent alternate water supply system to begin in 1992.

- In December 1989, the CDOW introduced a herd of 105 antelope in an area that includes the Landfill disposal site. Antelope were once indigenous to the area and the reintroduction program was the result of a ten-year planning effort. The CDOW is concerned that



ADAPTED FROM USGS, 7.5 MIN. QUADS.: SIGNAL PEAK, GUNNISON, IRIS, IRIS NW

● RESIDENCES NEAR WORK SITES

FIGURE 2.3
LOCATION OF THE LANDFILL DISPOSAL AND BORROW SITES NEAR GUNNISON, COLORADO

remedial action-related traffic in the area would result in antelope mortality. The proposed Tenderfoot Mountain haul road may restrict antelope access to their water supply.

- A second wildlife issue concerns the potential reduction in sage grouse use of breeding grounds (leks) and nesting habitat. Sage grouse may abandon the leks and nesting habitat because of the noise and the activity associated with the remedial action.

- The proposed Tenderfoot Mountain haul road would cross areas designated as wetlands by the U.S. Army Corps of Engineers (COE).

- The proposed disposal site is currently used for grazing by cattle six weeks a year in the spring.

Additional concerns were stated in comments on a previous version of this EA. These comments were received from city, county, state, and Federal entities, as well as several Gunnison-area residents. A brief summary is provided below:

- Many commentors objected to the possible use of the US-50 highway route alternative and to the assessment of impacts along the route. This transportation alternative is no longer under consideration.

- Commentors were concerned that wildlife values had higher importance than human life and health. This revised EA clarifies impact analyses. By eliminating the US-50 route, many of these concerns were alleviated.

- There were many concerns related to potential health effects from "escaping radon daughters." This text provides additional explanation of health effects and the various monitoring programs that the DOE uses at all sites to protect public health and the environment.

- Some concern was expressed over a possible understatement of impacts to cultural resources and a lack of data for adequate analysis of impacts. The DOE has provided new information in this EA.

- Concerns were expressed over various elements of the engineering design. These comments requested detail on design aspects that are not properly within the scope of an EA.

- The most common concern was a request for additional data. The purpose of this EA is to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or to issue a finding of no significant impact for the proposed action.

2.4 ALTERNATIVES TO THE PROPOSED ACTION

No action

The no action alternative consists of taking no steps toward the remediation of the processing site. The BLM would deny approval for the currently proposed action and would deny all permits associated with using the identified sites and haul roads on the BLM-administered land; thus, no public lands would be disturbed. The tailings pile and associated contaminated materials would remain where they are currently located. The selection of this alternative would not be consistent with the intent of Congress in the UMTRCA and would not result in compliance with the EPA standards.

Alternatives no longer under consideration

Placing all contaminated materials in a disposal cell within the designated processing site area has been extensively studied by the DOE. Several different cell configurations were analyzed and found to be technically suitable for long-term stabilization. However, two factors led to abandoning this alternative. One factor was related to adequate protection of the pile from a large flood event. There was a difference of opinion over the effectiveness of using large diameter rock to protect the pile from erosion. The other factor was related to local opposition. Many Gunnison residents felt that the presence of such a pile would detract from development in the area and leave a negative impression on tourists.

Returning the tailings to the mines from which the ore was obtained was determined to be not feasible. The ores processed at the Gunnison site came from mines in the Cochetopa Pass area southeast of Gunnison. The distance to these mines and the fact that the walls of many of these mines have collapsed eliminated this disposal method from further consideration.

The feasibility of reprocessing the tailings to recover residual uranium, vanadium, and molybdenum was evaluated. The evaluation concluded that recovery of vanadium from the tailings is neither technically nor economically feasible (DOE, 1982). In addition, reprocessing the tailings would not reduce their radium content. Since radioactive decay of the radium is the source of radon gas, there would be no reduction of the hazard from radon and radon decay products; hence, the reprocessed tailings would still require remedial action to meet EPA standards. Reprocessing was therefore eliminated from further consideration.

A number of potential disposal sites have been identified and evaluated under a DOE-approved alternate site selection process (ASSP) (DOE, 1986). These sites were found to be technically unsuitable and dropped from further consideration. The proposed Landfill disposal site was selected based on the results of the ASSP.

3.0 PROPOSED ACTION

3.1 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to consolidate and remove all contaminated materials associated with the Gunnison processing site to the Landfill disposal site six air miles east of Gunnison. This site is approximately 2,000 feet from the Gunnision County Landfill. The contaminated materials consist of 459,000 cy of tailings; 214,100 cy of contaminated soil from the ore storage, mill site, subpile, and other miscellaneous areas; 25,300 cy of windblown materials; 10,500 cy of miscellaneous rubble; and 10,000 cy of contaminated materials from vicinity properties. These contaminated areas cover 68 acres and the contamination averages three feet in depth.

All structures on the site (e.g., water tower, office buildings) were demolished in 1991. The debris is being stored on the site until it can be incorporated into the disposal cell at the disposal site. All contaminated materials would be trucked to the Landfill disposal site on a to-be-constructed haul road that crosses BLM-administered land. Section 3.3 provides additional description of the road.

At the disposal site, the contaminated materials would be placed on an excavated surface approximately ten feet below the ground surface. The excavated materials would be used as fill along the embankment sides and for the upper portion of the cover. The most highly contaminated materials would be placed first, followed by less-contaminated materials. All contaminated materials would be covered with a 1.5-foot-thick layer of fine-grained materials (radon barrier) to prevent radon emanation. A 0.5-foot-thick layer of gravel would be placed over the radon barrier. The gravel layer would act as a capillary break. Successive cover layers would include a six-foot one-inch-thick frost protection layer (73 inches), a 0.5-foot-thick sand/gravel bedding layer, and a 0.5-foot-thick layer of riprap. The tailings embankment would cover 29 acres; however, the final restricted site area would encompass 92 acres. The perimeter of the final restricted site may be fenced and signed with a warning specifying restricted access. The DOE would be responsible for a scheduled monitoring and surveillance program of the disposal site area. Figures 3.1 and 3.2 show the final pile configuration and cover system. A detailed description of the engineering design is found in the remedial action plan (DOE, 1990b). Prior to any activity at the disposal site, a Permanent Jurisdiction Transfer would be required by the BLM.

After completion of the remedial action, the processing site would be graded, seeded, and released for development or other productive uses. Restoration of the contaminated aquifer beneath the site would be evaluated during the groundwater restoration phase of the Uranium Mill Tailings Remedial Action (UMTRA) Project.

The remedial action is estimated to take three years. The first year would be spent in constructing the Tenderfoot Mountain haul road and preparing all work areas. The second year of the remedial action would be spent hauling all contaminated materials from the processing site to the disposal site. The last year would be spent in placing the various cover layers over the disposal cell and reclaiming all work areas in accordance

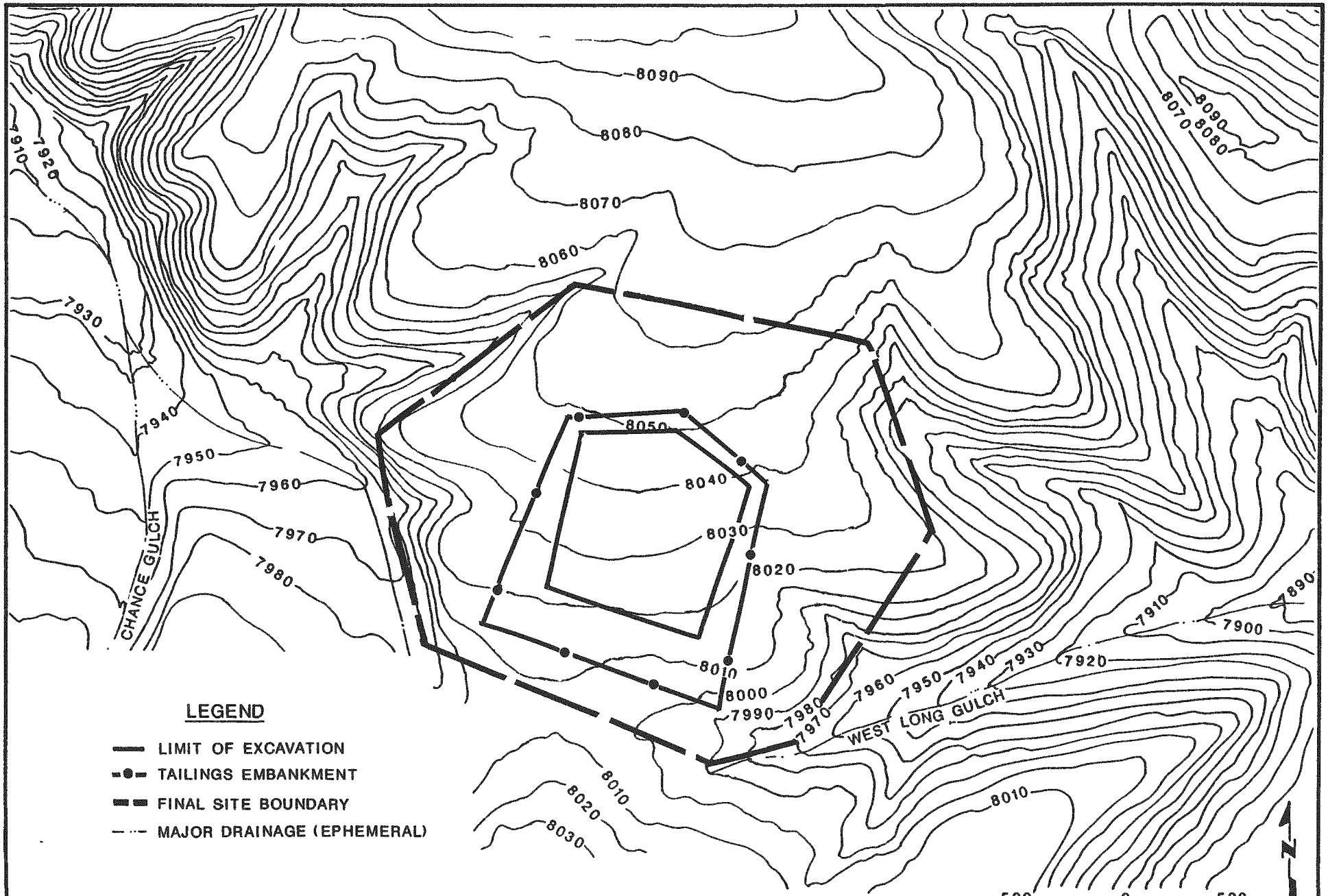


FIGURE 3.1
PLAN VIEW OF THE STABILIZED TAILINGS AND FINAL SITE BOUNDARY AT THE LANDFILL DISPOSAL SITE NEAR GUNNISON, COLORADO

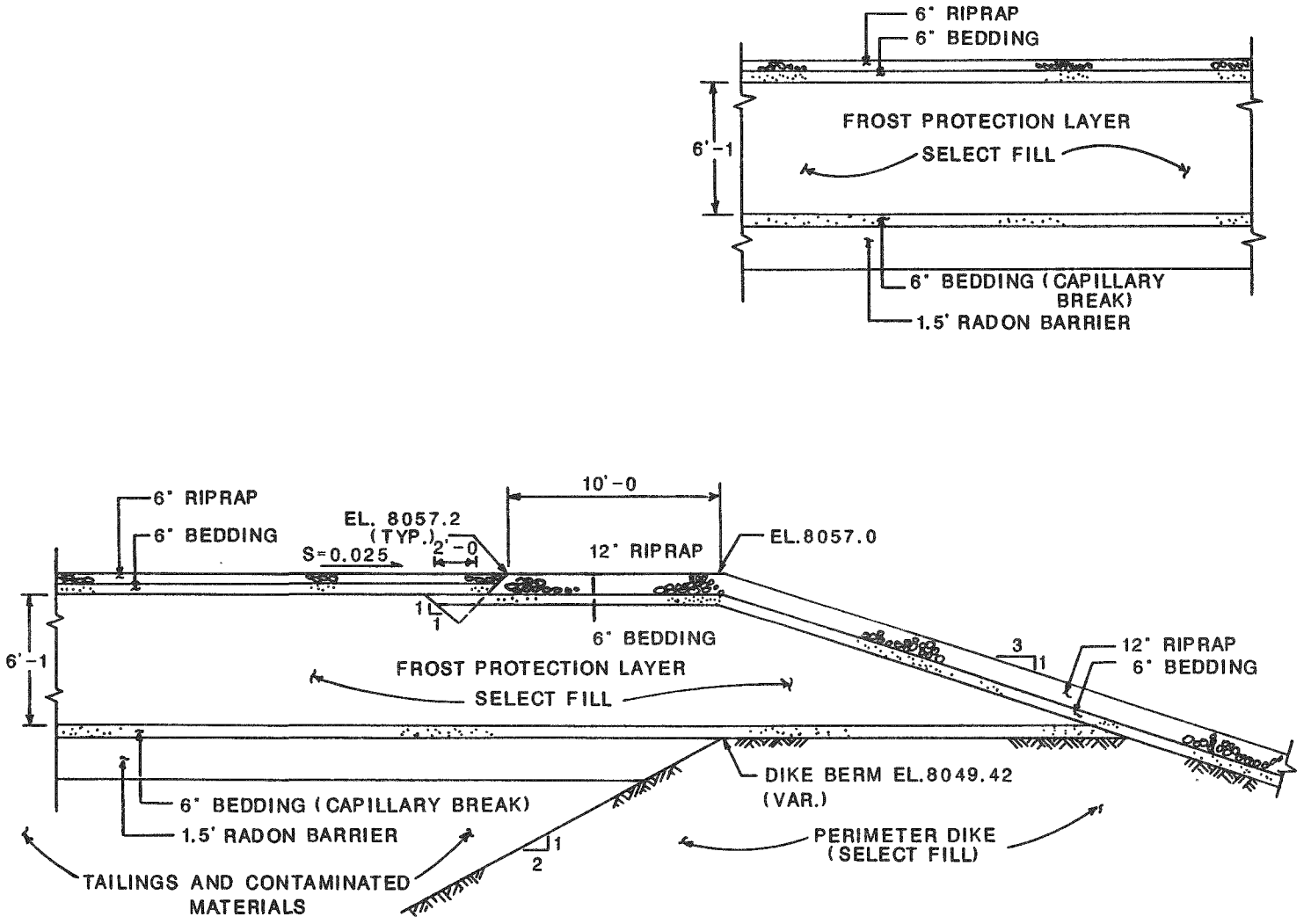


FIGURE 3.2

CROSS SECTIONS OF THE DISPOSAL CELL AND COVER AT THE LANDFILL DISPOSAL SITE NEAR GUNNISON, COLORADO

with owner requirements. During the haul phase (second year), two 6.5 hour work shifts per day, six days per week would likely be used. The remainder of the time, between 50-60 hours per week would be worked. Due to the potentially severe winter weather in the Gunnison area, construction would likely be limited to six months each year. All vehicles that leave contaminated areas and enter public roadways would be checked for contamination.

Background levels of total suspended particulates (TSP), radionuclides, and noise would be established prior to any remedial action-related ground-disturbing activities. Monitoring programs to ensure compliance with applicable standards or regulations would be developed and carried out by the remedial action contractor.

The proposed action includes the incorporation of the contaminated materials recovered from the known vicinity properties associated with the Gunnison processing site. Vicinity properties are properties that are located outside a designated site boundary and that have been contaminated by tailings dispersed by wind or water erosion or by removal by people before the potential hazards of the tailings were known. Cleanup of vicinity properties was started in 1991 and is scheduled to be completed with the remedial action; contaminated materials are being stored on the processing site until the start of the remedial action. If any additional vicinity properties are identified during the remedial action or prior to final cover placement, the contaminated materials would be incorporated in the Landfill cell. Any vicinity property material subsequently identified, however, will likely become the responsibility of the property owner, city, or county. The DOE is currently preparing guidelines to address such potential future occurrences. The impacts associated with the vicinity property cleanup were evaluated in a separate document (DOE, 1985) and are not discussed further in this EA.

3.2 BORROW SOURCES

Construction of the protective cover would require the use of rock, gravel, and other earth materials. There would be a need for three borrow sources. A commercial pit would be used to supply backfill materials for finish grading at the processing site and for surfacing the Tenderfoot Mountain haul road. The radon barrier materials and coarser soil would be obtained from the Sixmile Lane borrow site, located about one mile east of the disposal site on land administered by the BLM (Figure 2.3 and Section 4.7, Land Use). An estimated 275,000 cy of soils would be needed; the actual surface acreage disturbed is estimated at 60 acres. Land use in this area is similar to that of the disposal site area.

The source for rock materials is the Chance Gulch borrow site, located about two miles south of the disposal site, also on BLM-administered land (Figure 2.3). These materials would be used for erosion protection of the disposal cover; an estimated 77,000 cy of rock would be needed. Approximately 30 acres would be disturbed.

The disposal site excavation materials would provide the majority of the uncontaminated soils to be used in the construction of the disposal cell and temporary facilities.

The proposed use of Sixmile Lane and Chance Gulch borrow sites on BLM-administered lands would need to be authorized by a Free Use Permit (FUP) issued by the BLM. As part of the FUP authorization, no surface disturbance could occur at the borrow site until mining and reclamation plans were approved by the BLM. In addition, a Mined Land Reclamation Permit would need to be obtained from the state of Colorado Mined Land Reclamation Division prior to any ground-disturbing activities. All access roads would be reclaimed.

3.3 TRANSPORTATION ROUTES

An earlier version of this EA presented and evaluated two proposed transportation routes that were under consideration in 1990. Since distribution of this earlier version, the DOE has withdrawn the use of Federal highway US-50 as a transportation route. Public, city, and county comments raised concerns related to public health and safety (e.g., potential danger to school children who wait for school buses along US-50), the loss of several existing uses such as bicycling and jogging along the highway, and the city's perception that haul trucks would leave a negative impression on area visitors. The community was so adamant against the projected use of US-50 that the DOE concluded it would be difficult to obtain the necessary permits and dropped this route alternative from further consideration. This EA evaluates the proposed use of the Tenderfoot Mountain road to transport all contaminated materials from the processing site to the disposal site.

The truck transport of the contaminated materials would be done in accordance with the applicable U.S. Department of Transportation (DOT) regulations and any memorandums of understanding or other agreements between the DOE and DOT.

In early 1989, the DOE began evaluation of a haul route that would cross unpopulated BLM-administered land south of US-50. Loaded haul trucks would exit the southeast corner of the processing site and proceed south for 0.7 mile on a newly constructed road parallel and adjacent to Gold Basin Road but separated from it by a constructed barrier (Jersey barrier). The trucks would then continue east for 0.6 mile where they would intersect with the proposed Tenderfoot Mountain haul road (Figure 3.3). This road would traverse BLM lands in an eastward direction to the disposal site. The Tenderfoot Mountain haul road is currently a primitive jeep track that would need to be upgraded to a 24-foot-wide driving surface. Disturbance for road construction would cover a 40-foot width within a 100-foot right of way. The new road would have two-foot shoulders and be surfaced to handle the heavy haul truck traffic. Since preparation of the earlier version of the EA, the haul road has been realigned to avoid impacts to a spring and wetlands area, wildlife use areas, and cultural resources. Although the road is considered a dedicated haul road for this project, public access through the area cannot be restricted, but would be discouraged. The road would be signed to warn backcountry users. Any public vehicles found on the road would be escorted off and monitored for contamination before release to public roads. The entire road would be monitored for contamination on a scheduled basis. Trucks carrying contaminated materials would be covered or surfactants would be used on the tailings. At the end of the remedial action, the road would be scarified

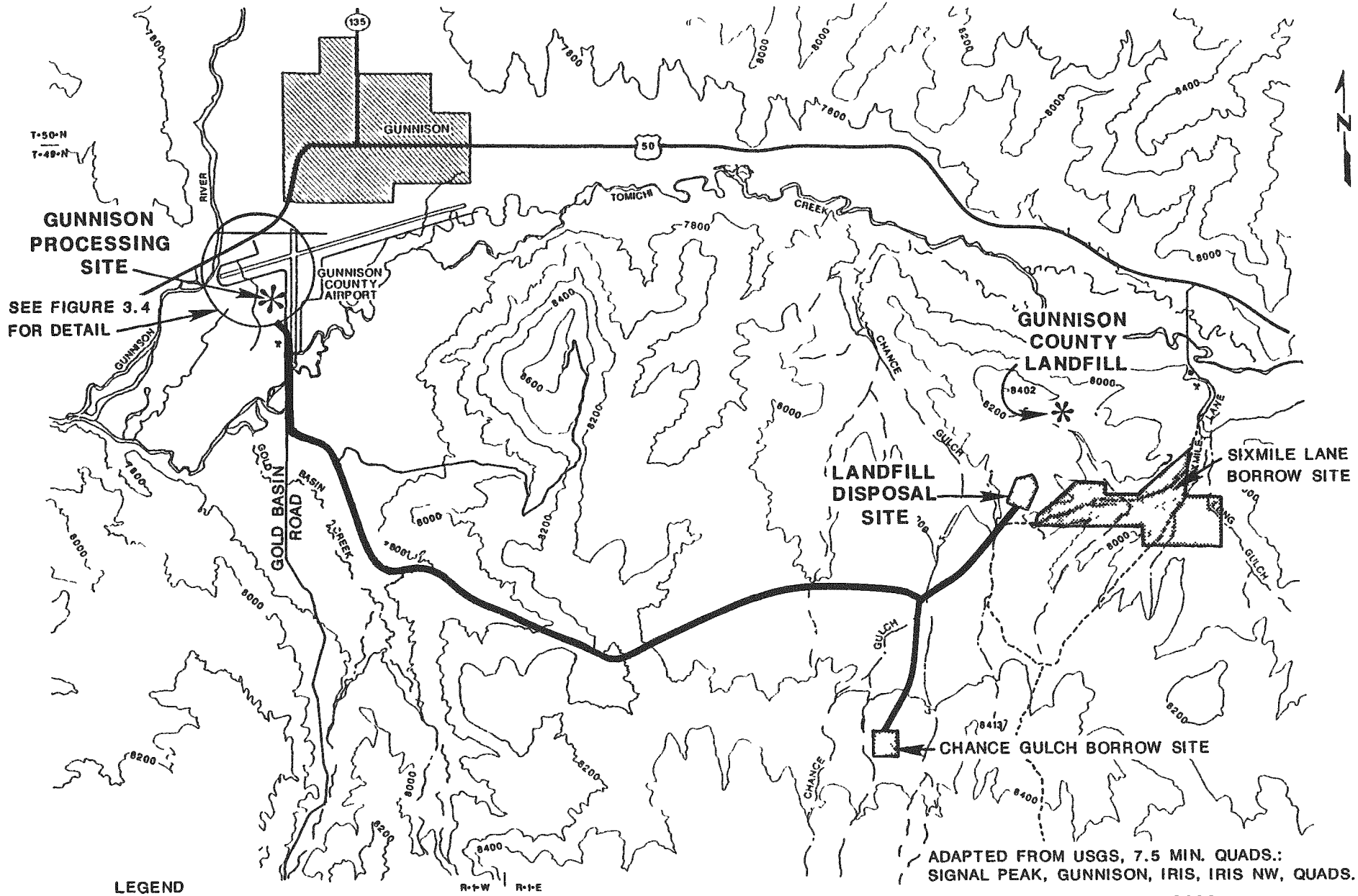


FIGURE 3.3
PROPOSED TENDERFOOT MOUNTAIN HAUL ROAD TO THE LANDFILL DISPOSAL SITE NEAR GUNNISON, COLORADO

and reduced to a 14-foot-wide driving surface in some areas and completely reclaimed in other areas in accordance with land owner reclamation requirements.

Current use of the existing primitive road is minimal and includes occasional use by BLM employees and hunters or other recreational users to access other areas of BLM lands. In addition to wildlife use, the area is part of a grazing allotment that is used for cattle six weeks of the year. See Sections 4.6, Flora and Fauna, and 4.7, Land Use, for additional information.

Gold Basin Road realignment

Barriers would be erected on Gold Basin Road at the northwest and southeast corners of the processing site to direct local traffic onto Goodwin Lane. Gold Basin Road would be realigned across the southern portion of the processing site to enable local residents to travel to the city of Gunnison without commingling local traffic and UMTRA Project traffic. The realigned road would be constructed in accordance with Gunnison County road requirements (Figure 3.4). The location of the realigned portion of Gold Basin Road may be changed after completion of the remedial action.

Access to borrow sites

The proposed commercial borrow source is located adjacent to the processing site and would not require an additional access road. The Sixmile Lane borrow site is bisected by an existing dirt road that would be used for project traffic. A new road approximately 7000 feet long would need to be constructed from the Chance Gulch borrow site to intersect the Tenderfoot Mountain haul road. This road would be 24 feet wide and have two lanes. After remedial action is complete, the road would be regraded and seeded per BLM requirements.

3.4 CONFORMANCE TO LAND USE PLANS AND POLICY

The disposal site, two borrow sites, and the majority of the Tenderfoot Mountain haul road are on BLM-administered land and subject to their resource management plan as well as to the specific permit requirements discussed in Section 3.2. These areas have historically been used for grazing, by wildlife, and for extraction of minerals. The preferred alternative in the draft Resource Management Plan for the Gunnison Resource Area includes continued use for livestock, grazing, wildlife habitat, minerals, and recreation (BLM, 1991). At the time of this writing, the BLM, as a cooperating agency, endorses the remedial action and the use of the proposed disposal site. As a cooperating agency to the CDOW, the BLM may endorse the need to mitigate wildlife concerns related to the antelope herd and sage grouse. See Section 6.0 of this EA for further information on mitigation.

In addition to the BLM plans and policies for the disposal site area, the proposed action would need to conform to Gunnison County land use planning requirements. Gunnison County land use policy does not prohibit

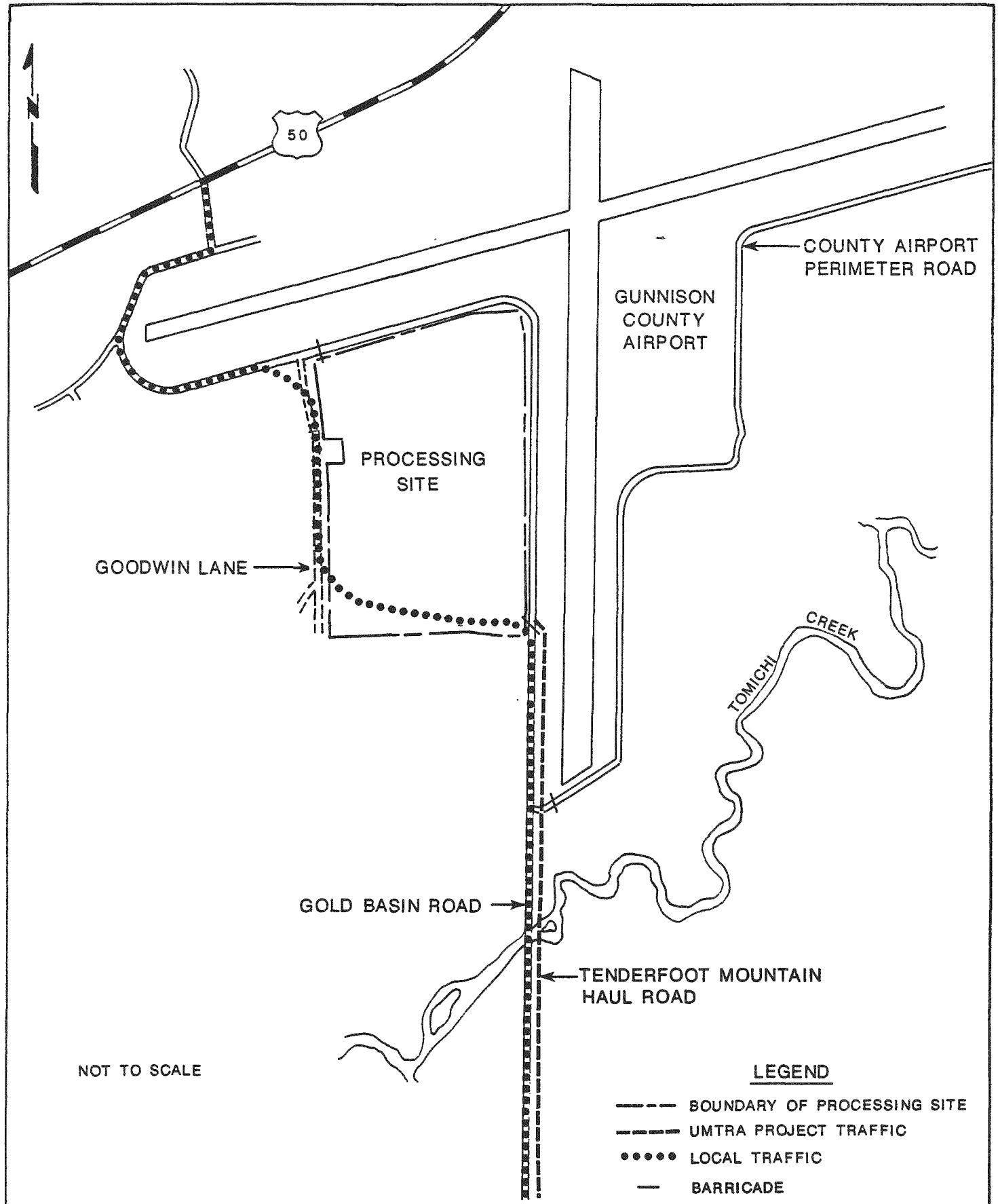


FIGURE 3.4
PROPOSED REALIGNMENT OF GOLD BASIN ROAD
NEAR GUNNISON, COLORADO

the proposed action. The County would consider any requirements placed on the DOE by the BLM as well as other agencies and the public. The land use planning process requires extensive review, analysis, and documentation of the proposed action by county and city officials; the public is invited to attend meetings as well as provide comments on all documents related to the proposed action. The DOE intends to comply with all county land use planning requirements.

3.5 COMPLIANCE WITH EPA STANDARDS

The purpose of the proposed remedial action is to stabilize and control all contaminated materials associated with the Gunnison processing site in a manner that complies with the EPA standards in 40 CFR 192. Consistent with this purpose and the EPA standards, the following major design objectives were established for the proposed action.

- Levels of radium-226 (Ra-226) will be reduced to levels consistent with the EPA standards in areas released for unrestricted use. The concentration of Ra-226 in soil averaged over any area of 100 square meters will not exceed the background level by more than 5 picocuries per gram (pCi/g) averaged over the first 15 centimeters (cm) of soil below the surface, and 15 pCi/g averaged over 15-cm-thick layers of soil more than 15 cm below the surface. If residual radionuclides other than Ra-226 and its decay products are present in sufficient quantities and concentrations to pose a significant radiation hazard, supplemental standards shall be developed and applied with NRC concurrence. Remedial action shall reduce other residual radioactivity to levels that are as low as reasonably achievable.

- The engineering design controls will be effective for up to 1000 years to the extent reasonably achievable and, in any case, for at least 200 years.

In addition, the disposal site design must comply with the proposed EPA groundwater protection standards for inactive uranium mill sites, in Subparts A and C of 40 CFR 192. The DOE has designed a multicomponent cover system that would meet the radiation protection standard, reduce the amount of infiltration from precipitation, and maintain protection of the radon barrier from frost and biointrusion. The cover system would achieve compliance with the propopsed EPA standards.

The design of the disposal cell considered the importance of the effects of transient drainage on subsurface drainage into the subsoils beneath the disposal cell, the relation of transient drainage to the thickness of the subsoils required to attenuate hazardous constituents in the tailings seepage geochemically, the retention of tailings seepage in the unsaturated zone as soil moisture, and dilution and dispersion in the uppermost aquifer.

The results from the geochemical attenuation testing of disposal site subsoils indicate that no hazardous constituent would exceed the proposed concentration limits at the point of compliance (POC), which is within the final restricted site boundary. Should the proposed concentration limits

be exceeded for any hazardous constituent at the POC, the DOE would investigate methods of corrective action to bring the disposal cell into compliance. When final standards are promulgated, the DOE will evaluate groundwater protection requirements and will undertake any action necessary to ensure that the final standards are met. The need for and extent of aquifer restoration at the processing site will be evaluated in accordance with the NEPA of 1969 and its amendments in a separate document.

4.0 AFFECTED ENVIRONMENT

4.1 CLIMATE AND AIR QUALITY

The Gunnison area is characterized by low humidity, frequent sunny days, and large daily and seasonal temperature ranges. The average annual temperature is 37° F and ranges from an average temperature of 10° F in January to 62° F in July. The average annual precipitation is 11 inches. Maximum rainfall occurs during the months of July and August, while the least rainfall occurs between the months of April through June. Thunderstorms are common during the summer. The average annual snowfall accumulation is 58 inches, with the largest amount falling during the month of January (NOAA, 1984).

Winds in the Gunnison area are influenced by the local topography (e.g., mountains and valleys). However, the development of strong wind patterns typical of mountain and valley settings is somewhat lessened due to the relatively small size of the airshed. Windflow data for the period 1973 through 1977 indicate that winds over five miles per hour (mph) are predominantly from the south-southwest to south-southeast quadrants. The average windspeed was 4.5 mph (Isbill, 1980).

No climatic data are available for the disposal site; however, it is likely that temperature and precipitation data would be similar to that of Gunnison.

An air quality monitoring station was in operation in Gunnison until 1980. Based on a seven-year collection period, only maximum concentrations of TSP were found to exceed State of Colorado Secondary Standards (CDH, 1980). Currently, there are no air quality monitoring stations in Gunnison. The closest monitoring is done in Crested Butte and Montrose, Colorado; both of these towns are too distant for the data to be relevant.

The disposal site is about six air miles east of Gunnison in open rangeland. It is expected that the criteria pollutant levels in this area would be lower than in the Gunnison area because the only potential source of air pollutants is the county landfill 2000 feet northeast of the disposal site.

4.2 GEOLOGY AND SOILS

The Gunnison processing site is located on floodplain alluvium between the Gunnison River and Tomichi Creek, about 1.5 miles upstream from their confluence. The floodplain is the surface of a gravelly alluvial valley fill approximately 130 feet thick near the processing site. Highly permeable sand and gravel channel deposits, which form the valley's major aquifer, directly underlie the tailings pile.

Several very low terraces, separated by river cut scarps, have been recognized in the valley bottom near the processing site. The tailings pile is located on the lowest (or youngest) such terrace above the present floodplain. The sequence of terraces shows that the Gunnison River channel has recently migrated from the eastern to the western side of the valley,

while incising periodically. The channel is slightly sinuous and exhibits braiding due to channel splitting around bars and islands, and cut-off meanders. This pattern suggests a mixed sediment load and a moderate rate of channel shifting within the floodplain.

The Landfill disposal site lies on a drainage divide on a very gently sloping, dissected, erosional pediment surface. The topography of the site reflects slow downslope movement of the material across the pediment surface. Soil formation and movement of the material within the surficial deposits are affected by seasonal freeze-thaw cycles. Fluvial processes on the site do not currently have much effect on surface sediment movement. Rather, sheet flow erosion appears to be the more dominant process currently shaping the site topography.

Net surface erosion in the disposal site area is insignificant. Erosion appears to be occurring as uniform removal of surficial material across the land surfaces. Some localized soil erosion occurs off the site in the small rills and gullies at the heads of the large drainage channels that dissect the perimeter of the pediment.

The processing and disposal sites are in an area that is not seismically active.

The processing site area overlies sand and gravel resources that are generally saturated to within a few feet of the natural ground surface; similar deposits are widespread throughout the Gunnison Valley. In the area of the disposal site, sand and gravel resources are also present. An active sand and gravel operation is located north of the Landfill site along County Road 42.

Soils at the Landfill disposal site are one to five feet thick and consist of silty sands and gravels with cobbles and boulders up to two feet in diameter. Larger rocks that weather out of the Tertiary Gravel Formation remain as lag deposits that armor the pediment slopes. A caliche zone that is slightly cemented occurs as a "c" soil horizon at depths of two to five feet. See Attachment 2, Geology Report, of the remedial action plan for additional information (DOE, 1990b).

4.3 SURFACE WATER AND FLOOD HAZARD

The Gunnison processing site lies in the Gunnison River basin, 0.4 mile east of the Gunnison River, 0.4 mile northwest of Tomichi Creek, and 1.5 miles above the confluence of the two. Drainage across the site is to the south and east toward Tomichi Creek. The site is bounded on the west by small storm drainage ditches and on the south and west by an irrigation ditch.

The Gunnison River has a drainage basin of 1012 square miles above its confluence with Tomichi Creek and an average flow of about 700 cubic feet per second (cfs). The maximum recorded flow of the Gunnison River for the 55 years of record was 11,450 cfs in 1918 (USGS, 1984).

Tomichi Creek has a drainage basin of 1061 square miles above its confluence with the Gunnison River and has an average annual flow of about 160 cfs. A maximum flow of 1890 cfs was recorded in 1957 (USGS, 1984).

Snow generally melts from May through June in the Gunnison area. Based on recorded flow data, maximum flows occur in the Gunnison River Basin during the spring runoff. Runoff from snowmelt is occasionally augmented by rainstorms; however, precipitation in the spring is generally the lowest of the year (USGS, 1984).

There is no evidence to indicate that surface water quality in the Gunnison River and Tomichi Creek has been affected by contaminants leaching from the Gunnison processing site. Based on the results of computer modeling, water levels from the 500-year flood of either Tomichi Creek or the Gunnison River would not impact the processing site.

The Landfill disposal site is located 2000 feet south-southwest of the Gunnison County Landfill. The average elevation of the site is 8040 feet above mean sea level. The disposal site area is on the southern slope of an 8402-feet high mountain, and is bounded on the west by Chance Gulch and on the east by Long Gulch. The 17-acre upland drainage area of the site would contribute only small amounts of overland flow toward the pile. A large gully extends along the northern boundary of the site and drains into Chance Gulch. A small gully is located on the southeastern portion of the site. Storm runoff in this gully would flow into the drainage divide south of the disposal site.

Flooding is not considered a hazard at the disposal site because of the distance from, and elevation above, the closest stream channel.

4.4 GROUNDWATER

The processing site is underlain by recent floodplain and Holocene to Quaternary deposits associated with the Gunnison River and Tomichi Creek. The site is located approximately midway between the two streams. The recent floodplain and terrace deposits comprise the alluvial aquifer at the site. The aquifer materials are well graded and range in size from fine-grained clay to coarse-grained gravels and cobbles with occasional boulders. The thickness of these deposits below the site is undetermined; however, a borehole 200 feet southwest of the site encountered shale bedrock at 130 feet.

Groundwater elevations in the alluvial aquifer fluctuate seasonally at the site. The average depth to groundwater below the processing site is five feet. The highest groundwater elevations occur mostly in late spring and the lowest groundwater elevations occur in late winter. Groundwater beneath the site is recharged by the Gunnison River, Tomichi Creek, and local irrigation ditches. Groundwater at the site flows to the southwest and discharges to the Gunnison River and Tomichi Creek. The average linear groundwater velocity in the alluvial aquifer is 1229 feet per year (ft/yr).

Background groundwater quality in the alluvial aquifer is a calcium bicarbonate type. The pH of the alluvial aquifer ranges from 6.7 to 8.0 and the average total dissolved solids (TDS) content is 325 mg/l.

On-site testing of the tailings materials indicated that mean or median concentrations of seven hazardous constituents regulated by the EPA and listed in Table I of 40 CFR 264 as referenced in 40 CFR 192 were found to exceed the EPA's maximum concentration limits (MCLs). These constituents were found in tailings pore water and during tailings batch leach tests and included arsenic, cadmium, chromium, net gross alpha activity (gross alpha minus uranium), molybdenum, selenium, and uranium. Additionally, the mean or median concentrations of seven elements that are listed in Appendix IX of 40 CFR 264 as referenced in 40 CFR 192 exceeded the statistical maximum of background groundwater quality. These included antimony, beryllium, cobalt, copper, nickel, vanadium, and zinc. Iron and sulfate also occur at high concentrations in the tailings pore water. The pH of the tailings pore water is 3.

On-site/downgradient alluvial groundwater is a calcium sulfate type; the pH ranges from 5 to 13 and the average TDS is 1191 mg/l. Maximum observed concentrations of 10 hazardous constituents exceeded the MCLs in on-site/downgradient groundwater at the site. These include arsenic, barium, cadmium, net gross alpha, mercury, molybdenum, nitrate, radium-226 and -228, selenium, and uranium. Elements in Appendix IX of 40 CFR 264 as referenced in 40 CFR 192, with concentrations that exceeded the statistical maximum for background groundwater quality in on-site/downgradient groundwater include copper, nickel, sulfide, vanadium, and zinc. Of these elements, only uranium and zinc exhibit statistical evidence of groundwater contamination related to uranium processing. A uranium plume, defined by the 0.030 mg/l isopleth, extends approximately 4500 feet southwest of the site to the Gunnison River.

There are over 500 registered domestic wells within a two-mile radius of the site. Downgradient and immediately adjacent to the processing site are residences with domestic wells. More than 1600 feet downgradient of the site is a subdivision with over 100 domestic wells. All of these wells are completed in the alluvial aquifer and most are less than 26 feet deep. Twenty-two residences are known to have wells contaminated by uranium. The municipal water supply for the city of Gunnison comes from wells completed in the alluvial aquifer. All of the city of Gunnison municipal wells are upgradient of the site and are unaffected by the tailings pile.

The Landfill disposal site lies atop alluvial and colluvial materials, Tertiary sands and gravels, volcaniclastic mudflow and ash fall tuffs, Jurassic Morrison claystone and Junction Creek sandstone, and Precambrian metamorphic rocks. Groundwater beneath the disposal site occurs within the semi-confining volcaniclastic mudflow strata and in the lower Tertiary gravels as the uppermost aquifer. Average depths to the semi-confining zone and the lower Tertiary gravel aquifer are 49 and 107 feet, respectively. Groundwater recharges the lower Tertiary gravel aquifer by underflow from areas in the uplands to the south of the site. Within the general area of the site, groundwater flow divides into two components. One component of flow is to the northwest and follows the general topographic trend of Chance Gulch. The other component of flow is to the northeast and east and follows the general topographic trend of East

Long Gulch. The average linear groundwater velocity is 10 ft/yr to the northeast and 12 ft/yr to the northeast and east.

Background groundwater quality of the lower Tertiary gravel aquifer can be characterized as a sodium bicarbonate type, with a pH ranging from 6.8 to 9.9, and an average TDS of 304 mg/l. Concentrations of arsenic exceed the MCL in the lower Tertiary gravel aquifer.

Within a two-mile radius of the Landfill disposal site there are seven registered wells, five domestic and two livestock wells.

Additional detail and analysis is found in Attachment 3, Groundwater Hydrology Report, of the remedial action plan (DOE, 1990a).

4.5 RADIATION

Figure 4.1 shows the limits and depths of off-pile contamination relative to the tailings pile. The tailings pile consists of about 35 acres of nonhomogeneously mixed radioactive material with an average depth of 9.9 feet (DOE, 1982). Pile-derived contamination that exceeds EPA subsurface cleanup standards also has migrated into the subpile soil to an average depth of three feet.

Background exposure rates within two miles of the processing site ranged from 14 to 20 microroentgens per hour (microR/hr) and average 16.6 microR/hr (BFEC, 1984). The average Ra-226 concentration in surface soil (zero to six inches) at these background locations was 1.7 pCi/g, with a range of 1.4 to 1.9 pCi/g (BFEC, 1984). Annual radon-222 concentrations measured at locations on the tailings pile perimeter ranged from 3.9 to 7.0 picocuries per liter (pCi/l) and averaged 4.5 pCi/l (DOE, 1990c). In contrast, background concentrations at locations farther than 2000 meters from the processing site measured at the same time ranged from 0.38 to 0.57 pCi/l, and averaged 0.45 pCi/l.

Background exposure rates at the Landfill disposal site range from 16.8 to 20 microR/hr three feet above the ground, and average 18.5 microR/hr. Surface soil samples from zero to 15 centimeters deep have Ra-226 values ranging from 0.9 to 1.1 pCi/g with an average of 1.0 pCi/g, and thorium-232 values ranging from 0.8 to 1.2 pCi/g and averaging 1.0 pCi/g (TAC, 1986). Radon-222 concentrations were measured from April 29, 1989, to April 30, 1990, on a quarterly basis using integrating Track-Etch® detectors. Average radon concentration at the Landfill site was 0.6 pCi/l during this period (DOE, 1990c). Additional and more detailed information is available in the remedial action plan (DOE, 1990b).

4.6 FLORA AND FAUNA

Upland plant communities

The processing, disposal, and borrow site areas are located within the Great Basin sagebrush habitat of the Southern Rocky Mountain zone. The plant communities within the processing site area (including the adjacent windblown area) are indicative of the disturbed nature of the area.

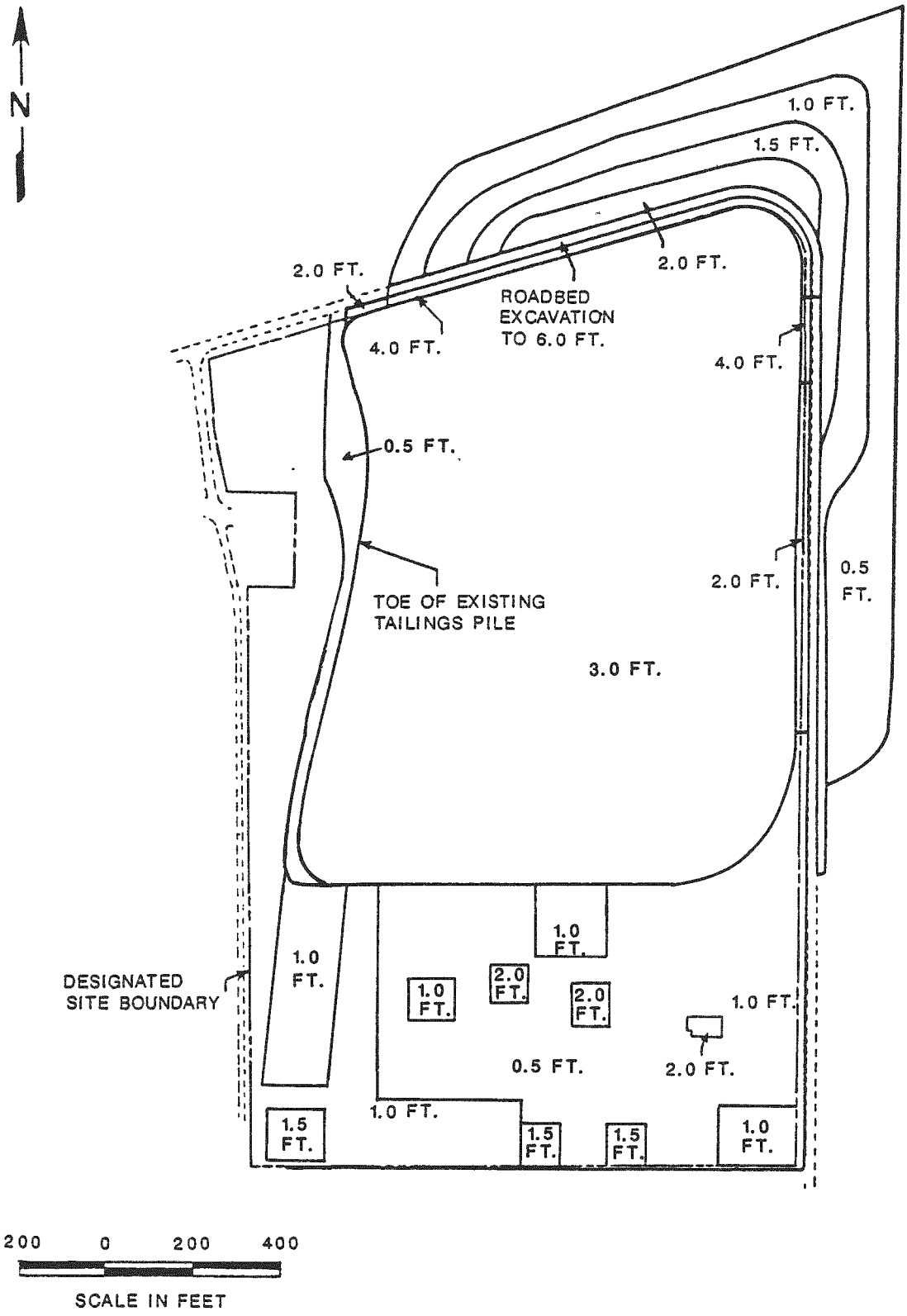


FIGURE 4.1
LIMITS AND AVERAGE SUBSURFACE DEPTH OF OFF-PILE CONTAMINATION AT THE PROCESSING SITE NEAR GUNNISON, COLORADO

Grasses and herbs predominate; an immature stand of cottonwoods grows at the western edge of the processing site.

The big sagebrush plant community type predominates at and near the Landfill disposal site, Sixmile Lane borrow site, Chance Gulch borrow site, and along the Tenderfoot Mountain haul road. Rabbitbrush and snakeweed also occur in this type and the grass and herb cover is fairly sparse. Interspersed with the sagebrush habitat are small areas of dry grassland habitat. Grass species such as blue gramma, western wheatgrass, and indian ricegrass occur in these areas. Shrubs are widely dispersed and big sagebrush, rabbitbrush, and winter fat are present. Small wooded areas (aspen and Douglas fir) occur on the north and east-facing slope in the area of the Landfill disposal site.

Wetland plant communities

Approximately 8.1 acres of COE-designated wetlands are found in the western portion of the processing site, within windblown contamination areas east of the processing site, and along the Tenderfoot Mountain haul road (see Attachment 1, Floodplain and Wetlands Assessment, of this EA for additional detail). Wetlands at the processing site consist of wet meadows dominated by grass, sedges, rushes, and herbs. Wetlands in the windblown contaminated areas are shrub-dominated (see Figure 3.3 of Attachment 1). A wet meadow type wetland along the haul road is dominated by grass, sedges, and rushes.

Fauna

Amphibians would be most common in the flooded wetland areas where species such as the leopard frog, boreal chorus frog, and tiger salamander may occur. Lizard species such as the short-horned lizard and sagebrush lizard would be more common in the sagebrush habitat and disturbed tailings area.

A total of 49 species of birds have been observed during various site surveys (see Table 2.3 in Attachment 2). The western meadowlark, red-wing blackbird, yellow warbler, and robin were common nesting species at and near the tailings pile. Wetland species such as red-wing blackbirds, waterfowl, and shorebirds were common in the flooded hayfields. The sage thrasher, sage grouse, green-tailed towhee, and various species of sparrows were common nesting species in the sagebrush habitat. No species of raptors are known to nest in the disposal or borrow site areas.

A total of 35 species of mammals may occur at the processing, disposal, and borrow sites. The pronghorn antelope, mule deer, coyote, and white-tailed jackrabbit were observed in the disposal and borrow site areas. Muskrat signs were observed in wetland areas. Other species typical of the disturbed and sagebrush habitats would be the desert cottontail and striped skunk. Mammals typical of the irrigated wetland habitat that would be expected in the area include the masked shrew, western jumping mouse, and muskrat. A small prairie dog town was observed at the north end of the tailings pile.

Game species

The disposal and borrow sites and much of the Tenderfoot Mountain haul road road are within the winter and the summer range of the mule deer and pronghorn antelope, but are not within critical winter range of the mule deer (Capodice, 1990; BLM, 1980). A herd of 105 pronghorn antelope was reintroduced into the Chance Gulch area during the winter of 1989-1990 (BLM, 1989). The herd dispersed over a wide area during the summer of 1990 and concentrated in the Chance Gulch area during the winter of 1990-91 (Capodice, 1990). The disposal site and much of the Tenderfoot Mountain haul road are located in sage grouse feeding and loafing habitat associated with leks (display grounds), along with nesting, brood rearing, and winter habitat (Hupp, 1985). Four leks are located in close proximity to the disposal site and the proposed Tenderfoot Mountain haul road. The Sixmile Lane and Chance Gulch borrow sites are in sage grouse nesting habitat; the Sixmile Lane borrow site is also in sage grouse winter habitat. Additional information on game species is available in a detailed analysis of game species of concern (TAC, 1991a).

Threatened and endangered species

Consultation with the U.S. Fish and Wildlife Service (FWS) to determine threatened and endangered (T&E) species and other species of concern began in 1985. This process resulted in six T&E species, one species proposed for listing, and five Federal candidate species being identified as potentially occurring in the Gunnison area. Two endangered bird species may occur near the site. The bald eagle occurs in small numbers during the winter along the Gunnison River, while the whooping crane stops to feed in the wetlands along Tomichi Creek during the spring and fall migrations.

The black-footed ferret is closely associated with prairie dog towns. A small prairie dog town was found on the north end of the tailings pile. Because of the highly disturbed nature of the area, and small size of the town, it is unlikely that any black-footed ferrets would be present.

Of the three endangered (Colorado squawfish, humpback chub, bonytail chub) and one proposed (razorback sucker) fish species, only the Colorado squawfish occurs in the Gunnison River. However, this species does not occur in the river in the Gunnison area.

There are five Federal candidate species that occur in the Gunnison area. The white-faced ibis and long-billed curlew occur in the wetland habitat along Tomichi Creek during migration; the snowy plover does not occur or occurs very sporadically in the Gunnison area. All potentially disturbed areas were surveyed for the presence of the skiff milkvetch and Gunnison milkvetch. No skiff milkvetch plants were found in any potentially disturbed areas; however, between 50 and 75 Gunnison milkvetch plants were found growing on the western side of the tailings pile in 1990. A subsequent survey in 1991, however, identified only two plants present.

Additional detail on threatened and endangered species is provided in Attachment 2, Biological Assessment.

4.7 LAND USE

The processing site is adjacent to the city limits of Gunnison and the Gunnison County Airport. The main paved runway is within 200 feet of the northern site boundary, and an emergency dirt runway is within 150 feet of the eastern site boundary. Gold Basin Road passes between the processing site and both airport runways; the land between the county road and the runways is owned by the county for expansion of the airport. The processing site has been acquired by the State of Colorado. An operating commercial gravel pit and concrete batch plant are on private land immediately south of the site. On private land west of the site are a park, a commercial campground with a grocery store and shower house, a small pond that is used by children for fishing, and five private residences (Williams, 1987; DOE, 1983; FBDU, 1981) (Figure 2.2).

Land use in the vicinity of the processing site is shifting from agriculture to more urban uses (i.e., light industry and residences). Within a three-mile radius of the processing site, beef cattle, sheep, and goats are grazed; hay and alfalfa are grown for export; and local residents keep gardens and fowl. The land north of the airport is in light industrial use and includes junkyards and trucking operations. The land east of the airport's dirt runway is available for industrial use, and the land south of the site is in industrial use (gravel operation). The land west of the site is primarily agricultural land, but there are also trailer parks, motels along US-50, numerous residences, a subdivision, and a number of other urban uses. There are three subdivisions with approximately 33 residences about one mile south of the processing site and off Gold Basin Road. The Tenderfoot Mountain haul road would be located behind (uphill) and within 0.25 mile of the Panoview subdivision, which contains 14 residences.

The Landfill disposal site, Sixmile Lane and Chance Gulch borrow sites, and the Tenderfoot Mountain haul road are on land administered by the BLM and used for low-density livestock grazing. The majority of these areas, including the haul road, are within the Tomichi grazing allotment, which contains 9100 acres with a grazing capacity of approximately 29 acres per animal unit month (AUM). An AUM is the amount of feed or forage required by one mature cow and calf for one month. The operator is permitted to run 242 cows between May 16 and June 26; the remainder of the year the area is used by wildlife only (Hinkle, 1991). A small portion (13 acres) of the Lower Cochetopa Commons grazing allotment is north of the proposed haul road. This allotment contains 30,259 acres and is permitted for use between May 15 and October 15 (Hinkle, 1992).

There are no mineral leases, oil and gas leases, or mining claims on file for any of the proposed use areas on BLM land (Cribley, 1988; Hurshman, 1988). Tertiary deposits underlie the Landfill disposal site area; these are comprised of gravels and clays that extend for miles in the area. It is highly unlikely that any oil, gas, or coal is present to be developed.

The Gunnison County landfill is approximately 2000 feet northeast of the disposal site. The closest residence to the disposal site is approximately 1.5 miles to the east along Sixmile Lane.

Land use within a three-mile radius of the disposal site includes grazing for beef cattle, sheep, horses, and goats; raising hay and alfalfa to feed livestock or to export out of the area; a daycare center at a private residence northeast of the disposal site; a commercial gravel pit; the Gunnison County Landfill; and area hunting for deer, elk, and rabbits. There are two occupied residences along Sixmile Lane and less than 10 residences along or near highway US-50 within three miles of the disposal site.

The area was evaluated for the presence of Areas of Critical Environmental Concern, wilderness, wild and scenic rivers, and prime farmlands and none were found to be present.

4.8 HISTORICAL AND CULTURAL RESOURCES

The disposal site, Sixmile Lane and Chance Gulch borrow sites, and Tenderfoot Mountain haul road are located in an area known to have a relatively high density of sites or cultural manifestations (GRI, 1991a). The cultural history of the Gunnison area begins with the Paleo-Indian Period, which occurred between 10,000 B.C. and 7000 B.C. This period was replaced by Archaic groups, which used a hunting and gathering lifestyle that continued until merging with the protohistoric Ute occupation. The Utes occupied the basin at the time of historic contact until their removal in the 1880s. Prospecting and mineral extraction brought many settlers to the Gunnison area in the late 1880s and 1890s. Subsequently, the construction of the railroads in the area around the turn of the century substantially encouraged growth. Livestock grazing became an important industry in the area.

A survey of an area adjacent to the tailings pile and including the processing site did not identify any archaeological resources, due in part to the disturbed nature of the area (CASA, 1987).

Class III surveys of the proposed Landfill disposal site, Sixmile Lane and Chance Gulch borrow sites, Chance Gulch access road, and the Tenderfoot Mountain haul road identified 53 cultural resource sites that included isolated finds, habitation sites, short-term camps, and toolkit sites (GRI 1991a, 1991b, 1987; Stiger, 1991). Staff and students from Western State College (WSC), Gunnison, Colorado, and local amateur archaeologists are developing several sites that were identified during the Class III surveys. Excavation of a large campsite has been the focal point for an archaeological field school affiliated with WSC. Projectile points and tool-making debris indicate that activity at the site occurred between 4000 and 8000 years ago (Stiger, 1991); Gunnison Country Times, 1991).

There are no known areas with religious significance to Native Americans.

4.9 SOCIOECONOMIC CHARACTERISTICS

Gunnison is the major town in Gunnison County. Based on 1990 census information, the county population was estimated at 10,273 and the population of the city of Gunnison at 4636 (USDOC, 1991). However, local

residents report that the census did not take into account the local college enrollment that averages 2400 students (Bushman, 1991). Area towns are small and generally have larger summer populations than year-round averages. Crested Butte, 30 miles north, is the only other town of size in Gunnison County, having a population of around 1200. Gunnison residents travel to Colorado Springs, Denver, or Grand Junction for items not available in Gunnison.

The Gunnison area is considered to have high recreational values. A 26-mile stretch of the Gunnison River, including the portion going through Gunnison, is considered a Gold Medal Fishery by the Colorado Division of Wildlife; hunting is popular in the surrounding mountains; a national ski resort (Mount Crested Butte) is located outside of Crested Butte; and the general picturesque mountain scenery and clear air attracts visitors from all over the United States.

In addition to recreational values, Gunnison has a state college (Western State College) with an average enrollment of 2400 students. The college schedules the majority of its classes between the end of August and mid-May.

Employment in the Gunnison area is primarily related to tourism, the government, the college, and agriculture. Employment patterns tend to be seasonal, with the highest unemployment occurring during the spring, summer, and fall. Based on 1990 census data, unemployment in Gunnison County averaged 4.9 percent, which was the same as the overall state of Colorado unemployment rate (State of Colorado, 1990).

Although no substantive information is available, rental or vacant housing appears to be unavailable during the majority of the college term.

In addition to Western State College, Gunnison has three elementary schools, one junior high school, and one high school with a total enrollment capacity of 1700 students. Enrollment in the elementary, junior high, and high schools in 1990 was 1194 students (Wright, 1991). Enrollment is below the capacity of the school system at this time.

Gunnison has one hospital with 24 licensed beds; current estimates are that the hospital is normally 25 percent occupied. Hospital care is also available in Grand Junction, Denver, and Montrose (Austin, 1987).

Police and fire protection are available within the city limits as well as in the county.

4.10 TRANSPORTATION

The city of Gunnison is accessed by US-50, a major, all-weather highway that junctions with Interstate 70 in Grand Junction, Colorado, (130 miles to the northwest) and Interstate 25 in Colorado Springs, Colorado (180 miles to the east). In the vicinity of Gunnison, US-50 is a two-lane, paved highway. In 1987, an average daily traffic (ADT) of 6700 vehicles on US-50 was recorded near the Gunnison County Airport and an ADT of 2700 vehicles was recorded approximately eight miles east of Gunnison, just west of State Highway 114 (Tenney, 1988). This segment of

US-50 is estimated to be able to carry up to 10,000 vehicles of all types per day safely (Vickers, 1987).

The processing site is accessed by Gold Basin Road. The majority of traffic on this paved, two-lane road is comprised of commuter traffic from the three subdivisions south of the processing site, and from traffic related to several area businesses. A 1987 traffic count estimated between 147 and 210 vehicles per day on Gold Basin Road (Crosby, 1987); more recent estimates are thought to be around 500 vehicles per day. Truck traffic associated with the gravel and concrete batch plant located just south of the processing site may add between 100 and 200 trucks per day during the summer months (Hart, 1990). A school bus also makes stops on Gold Basin Road and Goodwin Lane.

There is no accident information available for Gold Basin Road.

Gunnison County Airport is located immediately north of the processing site and it has runways adjacent to Gold Basin Road on the north and east sides of the processing site. The airport is used by commercial air carriers and private planes on a daily basis. In winter it is a terminal stop for skiers en route to Crested Butte, north of Gunnison (Fish, 1987).

The east-west runway receives summer use of a total of 114 weekly flights (arrivals and departures). Air traffic increases during the winter; an estimated 126 flights (arrivals and departures) occur per week in the winter (LeFevre, 1990). There is only occasional use of the north-south runway; however, this runway is an important alternative for landings when winds prevent use of the east-west runway.

5.0 IMPACT ASSESSMENT

5.1 INTRODUCTION AND ASSUMPTIONS

The environmental impacts of the proposed action and no action alternative are discussed in this section. Although some of the assumptions upon which the analyses were based may change, the impacts presented in the following sections represent a realistic upper limit for the severity of the impacts that may occur.

The following assumptions were used in the impact analysis: a three-year remedial action work schedule with two winter shutdown periods (six months each); one commercial source for gravel; stockpiling of soils from excavated areas; and the use of two borrow sites located on BLM-administered lands.

During the first year of the remedial action, work activities would primarily include the construction of all roads and the preparation of all work site areas. These activities would require approximately 70 workers employed 50 hours per week. During the second year, all contaminated materials would be transported to the disposal site and two, 6.5 hour work shifts per day, six days per week may be required. A maximum of 150 workers may be needed. During the final year, the cover would be placed on the disposal cell and all reclamation would be completed. Work force needs would reduce to a maximum of 100 workers employed 50-60 hours per week. These estimates are considered realistic but also speculative, since weather would be a significant factor in maintaining the work schedule and the construction contractor may find efficiencies or other requirements that would change work force needs.

If the remedial action is scheduled for four years, the second and third years would be used to transport the contaminated materials and the maximum work force during those years would reduce to 100 workers.

For either work schedule, the following labor categories would be needed: equipment operators, 20-25; truck drivers, 6-42; general laborers, 6-25; mechanics, 5-7; surveyors, 4-6; supervisory, 7-11. In addition, between 20-36 field management workers would be needed; these workers would monitor for radiation levels, supervise subcontracts, and oversee general operations.

5.2 NO ACTION

Without any type of remedial action of the Gunnison processing site, resource use, availability, and conditions would continue as previously discussed in Section 4.0, Affected Environment.

The cover on the existing tailings pile would not provide long-term protection from sheet and gully erosion. Further erosion of the cover could lead to transport of contaminants off the site by surface runoff. The Gunnison River is classified as being only moderately stable, with a high potential for channel and floodplain movement through either gradual or rapid migration. A rapid lateral shift of the streambed in the

direction of the pile could occur during a flood of the magnitude projected for a probable maximum flood (PMF). During the PMF, water up to eight feet deep would surround the pile. In addition, flow velocities in the vicinity of the pile could approach 18 feet per second. This combination of water depth and flow velocity could undercut the pile, destabilize the tailings, and lead to the transport of large quantities of contaminated material off the site.

Without remedial action, groundwater would continue to degrade. Contaminated dust from unvegetated portions of the tailings pile would continue to spread and jeopardize public health. An estimated 0.066 excess health effect per year would be attributed to off-site dispersion of radon decay products. Finally, the processing site, which is in an area suitable for development, could not be more productively utilized. In addition, no action at the Gunnison processing site would not meet the requirements of PL 95-604.

5.3 GENERAL IMPACT SUMMARY

The proposed remedial action would have no effect on the climate or geology of the affected areas, although it is recognized that both of these elements could have an effect on the longevity of the proposed engineering design and compliance with the proposed EPA groundwater standards. The specific engineering design elements to mitigate erosion include the three-to-one slopes (18 percent on the sides and 2.5 percent on the top) and the large rock (diameter equaled to eight inches or greater) used on the pile embankments. The disposal site location was selected because it is in an area of geologic stability and would not be subject to natural processes that could jeopardize the integrity of the disposal cell.

It is highly unlikely that any usable minerals (i.e., oil, gas, coal) are present beneath the disposal site. Furthermore, PL 95-604 requires that the mineral rights for the disposal site be transferred to the Federal government along with the disposal site. It also authorizes the Secretary of the Interior, with the concurrence of the Secretary of Energy and the Nuclear Regulatory Commission, to dispose "of any subsurface mineral rights by sale or lease...if the Secretary of the Interior takes such action as the Commission deems necessary pursuant to the license issued by the Commission to assure that the residual radioactive materials will not be disturbed by reason of any activity carried on following such disposition."

There would be no significant deterioration of air quality during the proposed remedial action. The most important air pollutant of concern would be uncontrolled fugitive dust. Much of the fugitive dust would be produced along the haul roads. It is assumed that using water, chemical additives, or a combination of water and additives as a dust suppressant would effectively reduce emissions by at least 50 percent. Covering the tailings on the trucks or using surfactants on them would also reduce fugitive dust. The state of Colorado has a no exceedence requirement for fugitive dust (total suspended particulates). In order to ensure compliance with the state requirements, the remedial action contractor would monitor for fugitive dust once work is in progress by taking 24-hour samples every three days. If it is determined that fugitive dust levels are exceeding state standards, work would be stopped and measures

implemented to ensure compliance. In addition, if winds exceed 40 miles per hour, all work would be stopped. A monitoring plan to ensure that air quality standards are not exceeded would be developed by the remedial action contractor and must be concurred in by the state of Colorado and Gunnison County before any ground-disturbing activities are initiated.

Disposal at the Landfill disposal site would require disturbance or excavation of 122 acres of topsoil. Although the clearing of 122 acres would constitute a permanent loss of topsoil, these materials would subsequently be used as part of the cover and side embankment fill for the disposal cell. Removal of contaminated materials and cleanup of the processing site would affect 68 acres. However, these soils are presently contaminated and cannot be used for agriculture or commercial purposes. Topsoil would be removed from the Sixmile Lane and Chance Gulch borrow sites (90 acres), and along the borrow site access roads (nine acres) and the Tenderfoot Mountain haul road (52 acres). An estimated 341 acres would be disturbed in all work areas.

Impacts at the processing site would include the loss of many of the cottonwoods that provide a noise and visual barrier, but also positive benefits associated with the availability of the land for more productive use and the psychological relief that the source of contamination has been removed and the project, after a decade of planning, has been completed.

5.4 RADIATION

The principal pathways by which individuals could be exposed to radiological hazards during the remedial action include the inhalation of radon decay products and airborne radioactive particulates, direct exposure to gamma radiation, ingestion of contaminated ground and surface water contaminated with radioactive materials, and the ingestion of food products produced in areas contaminated by tailings. For the calculation of health effects, only those pathways that would result in the largest radiological doses were considered in detail; these would include the inhalation of radon decay products, inhalation of radioactive particulates, and direct exposure to gamma radiation. The health impacts from the ingestion of contaminated groundwater by residents near the processing site has been addressed in a separate baseline risk assessment (DOE, 1990a), and will not be considered here. There is no contaminated surface water on the processing site.

Excess health effects are the number of fatal cancers that are estimated to occur in a population due only to the exposure to radiological contaminants associated with the processing and disposal sites and remedial action activities. To scale the results obtained, an individual in the United States has a 16 percent lifetime chance of contracting a fatal cancer, or one chance in six, due to all other causes in the society.

The detailed calculations and assumptions for the radiological health impacts are available in a separate document (Environmental Assessment Backup Radiological Impact Calculations, Gunnison, Colorado UMTRA Project Site) (TAC, 1991b). Since radon decay products are the predominant cause

of health effects, the radon/radon decay products impact analysis is summarized as follows:

- Processing site characterization data are analyzed to delineate the magnitude and limits of the processing site contamination to be excavated, hauled, and stabilized.

- Radon diffusion parameters are measured for contaminated soil and tailings.

- The surface radon flux is calculated for a given area and construction scenario using these input parameters, and a DOE/NRC approved radon diffusion computer code (RAECOM) for multilayered media.

- Radon concentrations at selected off-site receptor locations are calculated by atmospherically dispersing the radon generated from the modeled area source using local meteorological parameters.

- Outdoor and indoor radon decay product concentrations were estimated assuming 70 percent plate-out of radon decay products formed during transit from the source to the receptor location, a 50 percent indoor equilibrium between the calculated receptor radon concentration and the decay products. It was assumed that people spend 100 percent of their time at home: 25 percent outdoors, and 75 percent indoors.

- Excess health effects due to this scenario were calculated using a risk factor of 0.00035 excess health effect (fatal cancers) per person-working level month (WLM), where a WLM is defined as 170 hours of continuous exposure to an atmosphere containing the assumed fraction of short-lived radon decay products (50 percent) in equilibrium with 100 pCi/l radon.

During the implementation of the proposed action, the exposure to the general population from the radiological pathways would decrease as the contaminated materials are excavated on the processing site and transported from the populated Gunnison community. Remedial action workers would be exposed to contamination during remedial action. However, operational and institutional control measures such as wetting the work area or temporarily stopping work would be applied during remedial action to keep airborne radioactive particulate concentrations for the occupational workers and the general population at a non-hazardous level. No credit has been allowed in the health impact estimates for the effectiveness of mitigative measures.

A large radon flux is currently emanating from the unstabilized tailings pile and contaminated site soil. During construction activities, however, the site's average radon flux would be reduced by linearly decreasing the tailings pile surface area through vertical excavation of the tailings pile and subpile contamination and transporting it to a less populated disposal area. The radon flux at the disposal site, however, would increase from background to a maximum value when all the contaminated processing site material has been excavated and stabilized at the disposal site. As the radon barrier and frost protection soil is being placed, the flux would linearly decrease to the 20 pCi/m^2s design value. The increases in airborne radioactive particulates associated with the construction work

would be confined to the near vicinity of the processing and disposal sites, and mainly affect remedial action workers. Dust control measures (water sprays) would be routinely applied during construction work at both the processing and disposal sites and along the dedicated Tenderfoot Mountain haul road. The total health effects (including radon decay products exposure, gamma exposure, and airborne particulates) to the general population during remedial action would be 0.087, as compared to 0.17 if there were no remedial action for an equivalent time period (31 months). For an individual in the exposed population of 6783 within six miles of the processing site, 0.17 excess health effect for a 31-month period of exposure if no action occurs implies a chance of one in 39,900 of contracting a fatal cancer. Over 90 percent of the health effects estimated for the general public during no action or the proposed action are due to the inhalation of radon decay products. The total excess health effect to the remedial action workers during remedial action is estimated at 0.017. Exposure to radiation for the remedial action workers would be below the five rem per year annual effective dose equivalent standard for both internal and external sources established by DOE Order 5480.11, Radiation Protection for Occupational Workers.

Airborne particulate releases would be confined to the time interval during which contaminated material is excavated and consolidated into a stabilized disposal cell. The estimated 50-year committed effective dose equivalent per year of exposure during remedial action received by a remedial action worker from the inhalation of radon decay products and other radioactive particulates and the whole body dose due to external gamma exposure ranges from 1.4 to 2.1 rem for a typical worker on the processing and disposal site, respectively. These doses are less than 50 percent of the 5-rem radiation protection standard for occupational workers. However, the routine implementation of plans and programs to maintain occupational exposures to "as low as reasonably achievable (ALARA)" will further reduce the actual occupational doses, as well as the radiation exposure to the general population during remedial action. Proven measures, such as wetting construction areas to reduce dust and the use of respirators, will be implemented as needed to ensure that the actual worker exposures are well below applicable standards for the inhalation pathway.

Population exposure from material transport is considered negligible since 1) the contaminated material in the trucks either would be covered with a tarp or a special surfactant would be applied to prevent atmospheric dispersion of the material; 2) gamma exposure would be attenuated by the truck body and limited to the transit time of haulage to the Landfill site; and 3) radon emanation during truck transport would be significantly diluted by the ambient air. Therefore, combining the health effects for the general public and for remedial action workers, the total health effect for the proposed action would be 0.10. In contrast, an equivalent time period of no action (31 months) would result in 0.173 excess health effect. The comparative reduction of 0.07 excess health effect, as noted above, is due to the removal of higher activity tailings from the processing site and their transport to the less populated disposal site.

Any tailings spillage on roadways would be immediately cleaned up and, therefore, would only produce a potential short-term exposure to persons

near the spill. Contractors working for the DOE would be required to establish and implement procedures for responding and cleaning up spills.

The only transportation spill that could not be readily cleaned up would be one that occurs as a truck crosses a perennial stream or flowing ephemeral drainage. The potential of such an accident is low, although relocation of tailings to the Landfill disposal site using the dedicated Tenderfoot Mountain haul road has the possibility of this occurrence. If such a spill occurred, the concentration of radioactive elements and metals would be rapidly diluted by the flowing water. Emergency response plans would be immediately implemented to ensure that health effects would be negligible.

Prompt recovery of spilled material in wetland areas also would receive immediate attention. Efforts would be implemented either to rehabilitate areas disturbed by the cleanup process, or obtain regulatory approval for the acquisition of replacement areas in the event that the spill cleanup destroyed the impacted wetlands.

After completion of the remedial action, the radon release at the Landfill site would be no greater than that allowed by the EPA standards (EPA, 1983). Radon flux measurements would be made to ensure that the 20 picocuries per square meter per second (pCi/m^2s) standard is met in accordance with 40 CFR 61, National Standards for Hazardous Air Pollutants; measurements of radon concentrations at the disposal site boundary would also be made to demonstrate that the radon concentrations do not exceed 0.5 pCi/l above local background concentrations. Similar measurements of the disposal cell surface radon flux and boundary radon concentrations at other, complete UMTRA Project sites were indistinguishable from corresponding background measurements. Gamma exposure rates from encapsulated material would be essentially at background levels.

The proposed action would result in an analytically estimated 0.0002 excess health effect per year of exposure to the general public following remedial action, or one fatal cancer in the exposed population of 6,572 within six miles of the Landfill disposal site every 5,000 years. This would be more than a factor of 500 less than if no action were taken: one fatality every 15 years of no action, or 0.068 health effect per year of exposure for a population of 6,783 within six miles of the unremediated processing site. The modeled increase in the radon concentration above background at the surface of the disposal cell was 0.054 pCi/l, which in practice could not be detected by conventional measurement techniques. Although the disposal site is relatively remote, the city of Gunnison is still close enough that the small increase in modeled radon concentration and disposal cell radon flux would theoretically produce a limited number of excess health effects.

5.5 SURFACE WATER

During the proposed action, excavation of the tailings and other contaminated materials would disturb the surface of the processing site. Because the surface would then be more susceptible to erosion, runoff from the processing site would be more contaminated than under present conditions. In addition, contaminated water would be generated by on-site

activities, such as washing equipment and dewatering the tailings. To prevent contaminated water from migrating off the site, the remedial action design includes drainage and erosion controls such as interceptor ditches and an evaporation pond. An evaporation pond lined with polyvinyl chloride would be designed to retain the runoff from a 24-hour, 10-year storm. After removal of all tailings and contaminated materials from the site and vicinity properties, sediment in the pond and ditches would be removed and hauled to the disposal site for disposal.

Surface water runoff controls at the disposal site would be similar to those at the processing site. During remedial action, a temporary ditch would intercept surface runoff from the upland drainage area. Runoff from uncontaminated areas would be discharged off-site. As at the processing site, any contaminated sediment in ditches or ponds would be consolidated with the other materials during final configuration of the cell. Similar runoff and sediment controls would be established at the radon and rock borrow sites, except no contaminated sediment would be generated.

The erosion control features incorporated in the remedial action design would eliminate both on-cell and on-site erosion, thereby preventing the surface water transport of contaminated material. The top of the cell would be covered with riprap and sloped 2.5 percent. The slight slope and riprap layer would preclude the formation of gullies. The sides of the cell would slope three horizontal to one vertical. The rock used as the erosion protection layer of the sideslopes and topslopes would be sized to withstand concentrated flow caused by a one-hour, one-square-mile (m^2) probable maximum precipitation (PMP) storm centered over the site. A rock apron would be placed around the toe of the cell to eliminate erosion along the toe and to prevent undercutting into the tailings. This riprap apron would be sized to resist concentrated flow caused by a one-hour, one-square-mile PMP storm centered over the drainage area located north of the site. Because of the site's distance from, and elevation above, the nearest perennial stream, flooding and stream meandering are not considered hazards that could impact the disposal cell.

5.6 GROUNDWATER

Removal of all contaminated materials to the Landfill disposal site would remove the source of contaminants found in the groundwater beneath and downgradient of the processing site. Following removal of the contaminated materials, the aquifer would continue to flush itself of contaminants naturally. The rate at which this flushing would occur depends upon the mobility of specific contaminants within the aquifer and the effective hydraulic conductivity. The more mobile contaminants would move at approximately the same rate as the groundwater and be discharged to Tomichi Creek and the Gunnison River in a period of a few years to tens of years, depending on groundwater velocities. It is likely, however, that most of the contaminants exist as sorbed species or as solid precipitates, in which case these contaminants would have to desorb or be dissolved before being flushed from the aquifer. These contaminants are less mobile and require a longer period of time to flush naturally to surface water.

During remedial action, groundwater quality at the processing site would be monitored on a quarterly basis to assess the impacts, if any, of

construction on the groundwater quality beneath and downgradient of the site. Preliminary information on impacts to groundwater quality at other UMTRA Project sites during remedial action has been reviewed (DOE, 1990d). This information shows that in most instances inorganic elements and compounds monitored have been within the statistical ranges shown to exist by previous groundwater quality analyses. If the quarterly groundwater analyses at the Gunnison site show statistically significant rises in an element(s) or a compound(s), the situation would be assessed and appropriate action would be taken at that time.

Compliance with the EPA standards for groundwater protection (40 CFR Part 192) ensures that no groundwater contamination would be released beyond the final restricted disposal site boundary. The DOE has demonstrated that the proposed remedial action plan at the Landfill disposal site would comply with Subpart A (40 CFR Part 192) of the proposed EPA groundwater protection standards by meeting MCLs or background concentrations of regulated constituents at the POC. The DOE, through computer model simulations, has assessed the performance of the designed disposal unit at the Landfill disposal site in conjunction with the hydrogeologic system, and has shown that the disposal cell would minimize and control releases of hazardous constituents to groundwater and surface water, and radon emanations to the atmosphere to the extent necessary to protect human health and the environment.

The POC is a vertical plane that extends downward into the uppermost aquifer along the hydraulically downgradient limit of the disposal cell. This point is within the final restricted site boundary. Computer modeling simulated the groundwater flow system and associated transport of chemical elements beneath the disposal site. Results of the modeling predicted that the elements listed in Table 5.1 would not exceed the EPA MCLs or statistical maximum background concentrations for those elements that have no EPA MCL.

Disposal cell design considerations for the Landfill disposal site include the rate of infiltration through the cover of the cell and the relation of surface topography and final grading to surface drainage. Several design features were incorporated into the disposal cell as a result of the design considerations. A multicomponent cover has been included to reduce infiltration and meet the UMTRA Project longevity requirements. Construction water for dust control would be carefully monitored. Also, the performance of the disposal cell would be enhanced by the presence of favorable subsoil geochemical conditions.

The closest user of groundwater is 1.5 miles northeast of the disposal site. Low groundwater velocities and the favorable geochemical properties of the unsaturated materials present beneath and in the vicinity of the Landfill disposal site make the possibility of off-site contamination of present and future water wells remote.

5.7 FLORA AND FAUNA

An estimated 341 acres of land would be cleared during the remedial action. Upland plant communities that would be cleared at the processing site are the grass-dominated sagebrush and cottonwood types along with

Table 5.1 Proposed concentration limits at the POC for the Landfill disposal site, near Gunnison, Colorado[a]

Hazardous constituent[b]	EPA MCL	Background statistical maximum[c]	Proposed concentration limit[d]
Arsenic	0.05	0.053	0.053
Cadmium	0.01	0.0007	0.01
Chromium	0.05	0.02	0.05
Gross alpha (net)	15.0 pCi/l	11.9 pCi/l	15.0 pCi/l
Lead	0.05	0.01	0.05
Molybdenum	0.1	0.017	0.1
Nitrate	44.0[e]	11.9	44.0[e]
Radium-226 and -228	5.0 pCi/l	1.7 pCi/l	5.0 pCi/l
Selenium	0.01	0.0027	0.01
Silver	0.05	0.005	0.05
Uranium	0.044	0.008	0.044
Antimony	None	0.0015	0.003[f]
Beryllium	None	0.0025	0.0025
Cobalt	None	0.025	0.025
Copper	None	0.01	0.01
Nickel	None	0.02	0.02
Tin	None	0.0025	0.05[f]
Vanadium	None	0.01	0.01
Zinc	None	0.013	0.013

[a]Concentrations in mg/l unless noted otherwise.
[b]Hazardous constituents from Table 1 and Appendix IX of 40 CFR 264 as referenced in 40 CFR 192.
[c]Statistical maximum value in Landfill disposal site background groundwater quality.
[d]Proposed concentration limit is the higher value of MCL or statistical maximum background; the results of modeling indicate that the following limits can be achieved.
[e]Ten milligrams per liter as nitrogen.
[f]Laboratory method detection limit set by Barringer Laboratory, Denver, Colorado.

early successional plant species. The Landfill disposal site, Sixmile Lane and Chance Gulch borrow sites, and portions of the Tenderfoot Mountain haul road are in the sagebrush plant community type. Actual acreages disturbed within each plant community are available in a separate report (TAC, 1991a).

An estimated 6.1 acres of wetlands would be impacted by the remedial action. This includes 1.7 acres of wet meadow wetlands at the processing site, and 4.4 acres of wet meadows along the haul road. Supplemental standards would be applied to two acres of wetlands in the windblown contaminated areas and these would not be impacted. Details of the impacts on wetlands are found in Attachment 1 of this EA.

There would be no impacts on wintering pronghorn antelope or sage grouse use areas near the disposal or borrow sites because the project would be shut down for the winter. Indirect impacts on pronghorn antelope during the remainder of the year could result from haul truck traffic potentially restricting access to water north of the Tenderfoot Mountain haul road. In addition, haul truck traffic may result in antelope road kills. Impacts to antelope are anticipated to be minimal. Creating water sources south of the road would further reduce the impact of the proposed action on the pronghorn.

The indirect impacts of noise from trucks and other construction vehicles and the clearing of land at the disposal site could have an adverse impact on sage grouse use of leks and nesting habitat. An estimated 126 acres of grouse loafing and feeding habitat around four leks in the area would be cleared. This represents approximately 40 percent of this habitat type around the closest lek and could result in a sizable reduction of male sage grouse use of this lek. The direct and indirect effects of remedial action could eliminate or reduce nesting on 550 acres of habitat which, if it is assumed that the Chance Gulch area is good nesting habitat (Hupp, 1987) and that there is one nest per 10 acres (Klebenow, 1969), would impact up to 55 nesting grouse.

The Tenderfoot Mountain haul road may have an indirect impact on a lek that is located 100 feet from the road and is considered the most important lek in the area. If remedial action activities occur along this route during the strutting season for two or three years, then abandonment of this lek is likely due to lack of male recruitment, female grouse abandonment of the lek, and, eventually, adult male grouse abandonment of the lek. The remedial action activities are scheduled to begin no earlier than May 15 of each year in the vicinity of the disposal site to avoid disturbing the sage grouse during the breeding season.

Remedial action activities would not affect the bald eagle since construction activities would not take place near where they occur (along the Gunnison River) or during the time of the year they are in the area (winter). The whooping crane feeds in wetlands along Tomichi Creek during migration; remedial action would not impact this species because the haul road would cross the Tomichi Creek floodplain in an area little used by this species.

Remedial action would not directly affect the endangered or proposed fish species discussed in Section 4.6. However, use of water from the

alluvial aquifer of the Gunnison River for remedial action would result in a net depletion of water from the upper Colorado River basin, which may affect these species. This "may affect" determination requires the initiation of formal consultation with the FWS under the Endangered Species Act. According to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (FWS, 1987), a "may affect" determination would require a one-time contribution to the FWS of 10 dollars per acre-foot of water used based on an annual average. This would require a payment of approximately $1070 for the estimated 107 acre-feet per year used for remedial actions at the Gunnison site.

The white-faced ibis and long-billed curlew use the wetlands along Tomichi Creek during migration. The ibis are in the area during the summer. Remedial action would not affect these species because of the small amount of wetland habitat that would be impacted. The snowy plover is very rare in the Gunnison valley and the remedial action would not impact this species. The Gunnison milkvetch on the tailings pile would be eliminated during remedial action. Seeds from these plants were collected in 1990 and will be used to establish a population in a location as yet to be determined. See Attachment 2, Biological Assessment, for additional details on threatened and endangered species.

5.8 HISTORICAL AND CULTURAL

Activities associated with the proposed action would not impact any cultural resource sites known to be eligible for listing on the National Register of Historic Places at the disposal or borrow sites, along the Chance Gulch access road, or along the proposed Tenderfoot Mountain haul road. The isolated finds that were identified during the Class III surveys have been collected and placed in an appropriate repository. However, approximately 21 cultural resource sites identified along or near the Tenderfoot Mountain haul road, in the disposal or borrow site areas, or along the Chance Gulch access road are recommended for avoidance or mitigation by the State Historic Preservation Officer (SHPO) (Collins, 1991; Fike, 1991). DOE has realigned several segments of the haul road and Chance Gulch access road to avoid known sites. Due to the high probability of discovering additional sites and the potential to impact known sites near the road, a qualified archaeological monitor will be present during the initial clearing and excavation of the roads, disposal, and borrow site areas. If additional cultural resources are discovered during construction activities, a data recovery plan would be developed and implemented upon approval by the BLM and SHPO.

5.9 LAND USE

The final restricted disposal site containing the stabilized disposal cell and buffer area would encompass 92 acres; any future use of this area would be permanently precluded. The rock-covered disposal cell would cover 29 acres and the remaining area would be graded and seeded. The restricted site would remain under the control of the DOE and the remainder of the area withdrawn for the remedial action (30 acres) would be released to the BLM. The restricted site acreage would represent approximately one percent of the BLM grazing allotment in which it is located, and the loss of this

acreage would decrease the grazing capacity of the allotment by three to four AUMs.

During the remedial action, 68 acres within and adjacent to the processing site would be temporarily disturbed for the period of remediation. After remedial action, this disturbed acreage would be backfilled, graded to promote surface drainage, revegetated, and then eventually released for any use consistent with existing land use controls. The processing site is adjacent to the city of Gunnison's developed areas and would likely be considered more valuable land than the more remote disposal site.

During the remedial action, approximately 273 acres would be disturbed by activities related to the remedial action at the disposal site, along the haul road, access roads to the borrow sites, and the borrow sites. This would represent a temporary loss of 10 AUMS to one grazing permittee for six weeks each year of the remedial action. Since this acreage represents the projected disturbed area, it is likely that a larger area would actually be considered unusable by the permittee. The DOE would mitigate the loss of forage under the terms of the land use agreements with the BLM. The final restricted disposal site area of 92 acres would result in a permanent loss of three AUMs if the area is fenced, or one AUM if the area is not fenced. This loss would not be mitigated, based on the large size of the allotment. A second permittee would lose the use of 13 acres of pasture during the remedial action. The DOE would compensate the permittee for the loss of use of the pasture.

Disposal at the Landfill site would also require the temporary disturbance of an estimated 60 acres at the Sixmile Lane borrow site, 30 acres at the Chance Gulch borrow site, nine acres for borrow access roads, and 52 acres for upgrading the Tenderfoot Mountain haul road. After completion of the remedial action, the Tenderfoot Mountain haul road would be scarified and reduced to a 14-foot-wide driving surface in some areas and completely reclaimed in other areas. All other disturbed areas would be reclaimed and released for use in accordance with the Free Use Permit issued by the BLM. Typically, this permit requires reclamation that would return the disturbed area to a condition compatible with the surrounding lands. All disturbed areas would be graded, seeded, and possibly fenced for a period of two years or until vegetation is established to prevent livestock damage from adjacent areas that are open range.

5.10 SOCIOECONOMICS

The majority of the projected work force is anticipated to be hired locally or within a commuting distance from area towns, such as Montrose or Crested Butte, and would thus have little impact on local services such as schools, housing, water, and the like. Gunnison is accustomed to seasonal fluctuations in population related to students attending Western State College.

It is anticipated that 30 percent of the work force may come from Gunnison, 30 to 40 percent of the work force from area towns such as Montrose or Crested Butte, and 30 percent from other areas in the Four Corners region. An evaluation of the number of unemployed workers in Gunnison and Montrose Counties since 1980 shows that unemployment levels

are lowest during the summer when the remedial action will need workers. Over the three year period of 1989-1991, Gunnison County has consistently shown between 150 and 300 unemployed workers available for work during the summer, while Montrose County has shown between 450 and 1200 unemployed workers available for work during the summer. It is also assumed that other experienced truck drivers or equipment operators have taken jobs to "get by" and no longer register for work. The nearby North Fork Valley has had a depressed coal mining economy for several years. It is anticipated that there are many unemployed truck drivers in the Paonia area, although it is not a distance easily commuted on a daily basis (approximately 90 miles one way).

For an average work force of 100 workers, it is assumed that 30 workers would need housing. It is likely that several workers would share accommodations and that a few may find lodging with a family or students, leaving a need for 20 housing units. Although it is recognized that the city of Gunnison may have limited housing available, it is unlikely that workers would not be able to find 20 units within a commuting distance of the project. Because the project is of six months duration each year, workers would not likely stay in the area but would return to their homes during the six-month shutdown.

The total cost of the remedial action is estimated to be $13.8 million; this estimate does not include construction management or vicinity property cleanup. A positive impact from the remedial action is related to monies spent locally and within the state of Colorado. An estimated $6.2 million would be attributed to wages, consumable materials (e.g., rock borrow), and non-consumable materials (e.g., fencing) that would be purchased locally or attributed to area employment. It is assumed that 70 percent of the work force would reside within the area (i.e., would reside in Gunnison or be able to commute to Gunnison) and that wages or salaries would remain in the region. Research on the impacts of similar projects on rural areas in the western United States suggests that an indirect income multiplier of 1.23 (every dollar in wages, salaries, supplies, and materials would generate an additional $0.23 in indirect expenditures) would be appropriate to apply (Mountain West Research, Inc., 1979). Applying this multiplier to these expenditures results in a conservative potential indirect benefit of $1 million.

5.11 TRANSPORTATION

To avoid impacts on the residents who live south of the processing site along Gold Basin Road, Gold Basin Road would be realigned around the processing site so that no commingling of local and project traffic would occur. However, there may be unavoidable temporary interruptions in existing traffic patterns during construction of the realignment.

The greatest impact related to the transportation of the contaminated materials would be noise impacts experienced by residents of a subdivision an estimated 0.25 mile from the Tenderfoot Mountain haul road. If funding is available to support a three-year construction schedule, the second year of the remedial action would be used to transport the tailings. Assuming that a tractor-trailer truck combination were used, an estimated 3834 trips per month would be required to transport the tailings to the disposal site,

or, an estimated 160 trips per day. A four-year remedial action schedule would result in half the number of trucks per day, assuming the same tractor-trailer truck configuration and a two-year haul schedule. The final trucking configuration would be determined by the trucking contractor. Residents of the 14 residences within the subdivision currently experience little traffic noise. The location of the haul road upslope from the subdivision would amplify sound. Three surveys to establish background noise levels were conducted along the haul road above the subdivision in 1991. The DOE may further evaluate noise levels on the haul road on a weekly basis once remedial action is underway. Noise levels in Colorado are regulated through city, county, state, and Federal noise statutes. The DOE would comply with all applicable regulatory noise requirements.

The UMTRA Project safety record for highway and on-site accidents is significantly below any projections based on miles traveled and the numbers of workers on-site for similar projects. Because no traffic related to project activities would be on public roads, there are no projected injury or property accident statistics that would be applicable.

6.0 MITIGATIVE MEASURES

The following mitigative measures were incorporated into the design and approach for the proposed action in order to reduce the environmental impacts. Additional mitigation is under discussion at the time of this writing. The various permits required from the BLM will contain specific mitigative measures as necessary to satisfy BLM permit requirements. This mitigation would relate to wildlife, cultural resources, reclamation, and grazing. Other permits, such as a permit from Gunnison County, the COE, or the state of Colorado would also require statements of mitigation prior to issuing a permit to meet their needs. For example, the 404 permit issued by the COE would identify specific wetland mitigation requirements.

- Water, chemical additives, and/or a combination of water and additives would be used on all disturbed areas and unpaved haul roads to inhibit dust emissions; trucks would be covered or surfactants would be used during materials transport. All work would be stopped if fugitive dust emissions exceeded state standards.

- Borrow sites are proposed that are as close to the disposal site as possible to reduce costs and eliminate the impacts of long haulage distances.

- The transportation route was selected to avoid impacting Gunnison city residents and tourists.

- Continued close communication with the local population would be maintained through the established public information task force.

- Surface soils at the undeveloped borrow sites would be stockpiled for use in reclamation.

- Sage grouse leks would be monitored for possible project-related impacts and a mitigation plan would be implemented in consultation with the BLM and CDOW.

- To mitigate the loss of wetland areas, the DOE, in consultation with the COE, would replace lost wetland areas or enhance existing wetland areas.

- The DOE may provide water sources south of the haul road for wildlife use and may impose speed restrictions on the haul trucks to reduce potential pronghorn road mortality.

- To replace populations of the Gunnison milkvetch found growing on the tailings pile, seeds that have been collected would be sown during reclamation to reestablish a viable population. The designation of areas to be seeded with this species would be determined during consultation with the U.S. Fish and Wildlife Service and BLM.

- All disturbed areas will be reclaimed per stipulations by the land owner. Reclamation may include revegetation with plants native to the area and restricting grazing use of the reclaimed areas (e.g., fencing) until revegetation is established.

- To ensure the protection of worker health and public safety, radon monitoring stations and a spray system to control fugitive dust would be required.

- The DOE would develop and implement a data recovery plan prior to any ground disturbance for any significant or potentially significant cultural or archaeological sites that would be impacted by remedial action activities. Whenever possible, the DOE will try to avoid archaeological sites.

- The DOE would have an archaeologist present during clearing for the haul road and during clearing of the disposal and borrow sites.

- To prevent off-site contamination during transportation of the contaminated materials, all trucks would be monitored and decontaminated prior to entering public roads; all trucks would be restricted to the identified Tenderfoot Mountain haul road; and all traveled areas would have scheduled monitoring for radioactive contaminants.

- The Tenderfoot Mountain haul road and access points to the road would be signed to discourage casual use of the road.

- Air quality monitoring stations would be established to determine background levels of TSP and radionuclides prior to remedial action. During the remedial action, scheduled monitoring in accordance with the EPA and state of Colorado requirements would be done. All results would be included in a quarterly report to the Colorado Department of Health.

- The BLM, in consultation with the CDOW, would develop specific wildlife mitigative measure requirements prior to the remedial action to mitigate potential losses to pronghorn antelope and sage grouse.

- Environmental monitoring is a requirement of the UMTRA Project during remedial action activities at both the processing and disposal sites. Monitoring stations would be strategically located off-site at each construction site to monitor airborne particulates, radon, and environmental gamma radiation exposure. Selected receptor locations in the city of Gunnison that may be adversely impacted also would be monitored. This network of monitoring stations would assist the construction contractor in implementing radiological control measures to ensure that public health is adequately and appropriately protected in accordance with DOE Order 5400.5, Radiological Protection of the Public and the Environment.

7.0 CONSULTATION, COORDINATION, AND LIST OF PREPARERS

7.1 CONSULTATION AND COORDINATION

The DOE has held numerous meetings involving the public, county, and state representatives over the past six years. The changes in proposed disposal site locations and associated informational meetings have sensitized the local population to the UMTRA Project; the importance of the remedial action; and the general issues related to the various remedial actions. The following state and Federal agencies have been instrumental in providing information and assessing UMTRA Project impacts on their resources.

- Bureau of Land Management, U.S. Department of the Interior
  Gunnison Resource Area Office
  Barry Tollefson, Area Manager
  Tom Hurshman, Realty Specialist
  Joe Capodice, Wildlife Biologist
  Rich Fike, District Archaeologist

- Colorado Department of Health
  Wendy Naugle, Hydrogeologist

- Colorado Division of Wildlife, Colorado Department of Natural Resources
  Tom Henry, District Manager
  Tom Speeze, District Wildlife Manager
  Sherman Hebein, Fisheries Biologist

- Office of the Colorado State Historic Preservation Officer (SHPO)
  Susan M. Collins, Deputy SHPO

- U.S. Army Corps of Engineers
  U.S. Department of the Interior
  Ken Jacobson, Wetlands

- U.S. Fish and Wildlife Service, U.S. Department of the Interior
  John Anderson, Botanist
  Bob Leachman, Wildlife Biologist

7.2 LIST OF PREPARERS

The engineering design, including transportation routes, was developed by MK-Ferguson Company, the remedial action contractor (RAC) to the DOE.

This EA was prepared by the Jacobs Engineering Group, the technical assistance contractor (TAC) to the DOE, based on the design provided by the RAC.

Numerous individuals assisted in the production of this EA. The following individuals provided key expertise and were instrumental in the analysis of the project.

- Sandra Beranich, EA document coordinator, land use, socioeconomics, transportation.
- Chuck Burt, wildlife, wetlands, threatened and endangered species, air quality.
- Jim Crain, conceptual design, flood analysis.
- Paul Darr, hydrogeology.
- Andria Dutcher, editing.
- Len Flowers, risk assessment
- Douglas Gonzales, health physics.
- Mary Beth Leaf, cultural resources.
- Gerry Lindsey, geology, soils.

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ATTACHMENT 1 FLOODPLAIN/WETLANDS ASSESSMENT

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1.0 INTRODUCTION

In 1979, the U.S. Department of Energy (DOE) established regulations (10 CFR 1022) to comply with floodplain/wetlands environmental review requirements. These regulations provide for compliance with Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands. The regulations are designed to be coordinated with the environmental review requirements of the National Environmental Policy Act. This attachment provides an assessment of impacts on the floodplains and wetlands associated with the Gunnison uranium mill tailings remedial action project pursuant to 10 CFR 1022.

The proposed action includes removal of uranium mill tailings and associated contaminated materials from a uranium mill tailings processing site located immediately south of Gunnison, Colorado. These materials would be transported to a disposal site approximately six air miles east of Gunnison, Colorado. The processing site is located on a floodplain between the Gunnison River and Tomichi Creek. A summary of the proposed action appears in Section 3.0 of the environmental assessment.

2.0 FLOOD ANALYSIS

Gunnison processing site

Flow rates for the Gunnison River and Tomichi Creek during 10-, 50-, 100-, and 500-year floods were estimated by plotting streamflow data as a log-Pearson Type III distribution and selecting flow rate values from the resulting curve. Recurrence intervals and the corresponding flow rates for the two streams are presented in Table 2.1. A 500-year flood of the Gunnison River or Tomichi Creek would not impact the processing site but would flood portions of Gold Basin Road that would be used by project traffic. (See Figure 2.1 for the 100- and 500-year floodplains.) As the site does not lie in the floodplain, no statement of findings is needed.

Two computer models were used to simulate a Probable Maximum Flood (PMF) of the Gunnison River and Tomichi Creek. The HEC-1 (COE, 1981) computer model was used to calculate flow rates in the two rivers during a Probable Maximum Precipitation (PMP). Using the PMP flow rates as input parameters to the HEC-2 (COE, 1982) program, hydraulic conditions of the Gunnison River and Tomichi Creek near the processing site were simulated.

Based on the HEC-1 analysis, the maximum flow rate, or PMF, of the Gunnison River and Tomichi Creek would occur during a September, 24-hour general-storm PMP (Figure 2.2). The maximum flow at the confluence of the two rivers was estimated to be 514,000 cubic feet per second (cfs). The peak flows in the Gunnison River and Tomichi Creek would occur at different times; thus, the discharge at the confluence is less than the sum of the flow rates on the two rivers. The maximum discharges of the streams are summarized in Table 2.2.

Table 2.1 Flow frequency forecasts

Recurrence interval (years)	Annual exceedance probability	Flow rate (cfs)[a]	
		Gunnison River	Tomichi Creek
10	0.10	5762	1501
50	0.02	7967	1904
100	0.01	8930	2050
500	0.002	11251	2340

[a]Cubic feet per second.

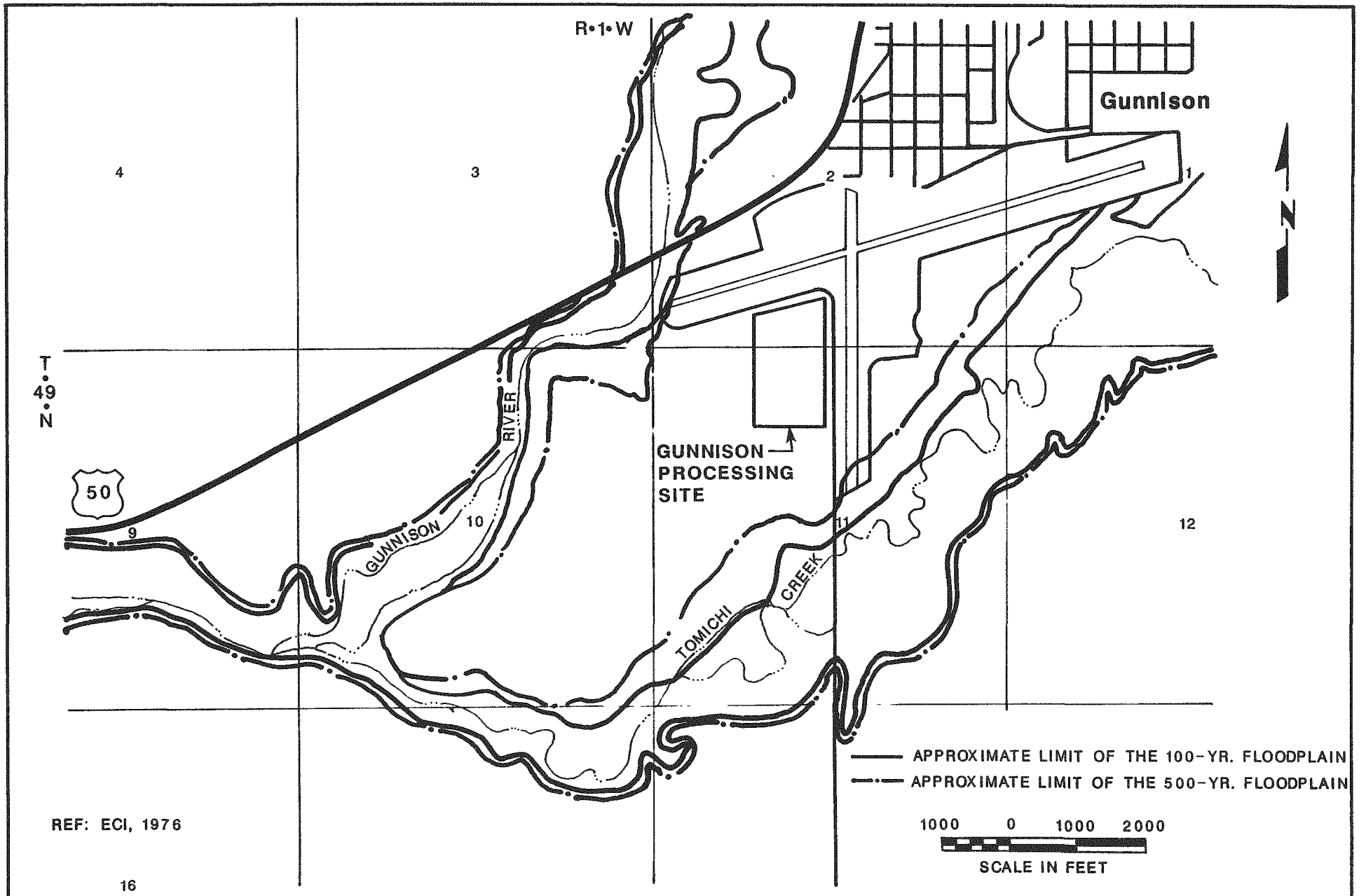

FIGURE 2.1
100 AND 500-YEAR FLOODPLAIN OF THE GUNNISON RIVER AND TOMICHI CREEK IN THE VICINITY OF GUNNISON, COLORADO

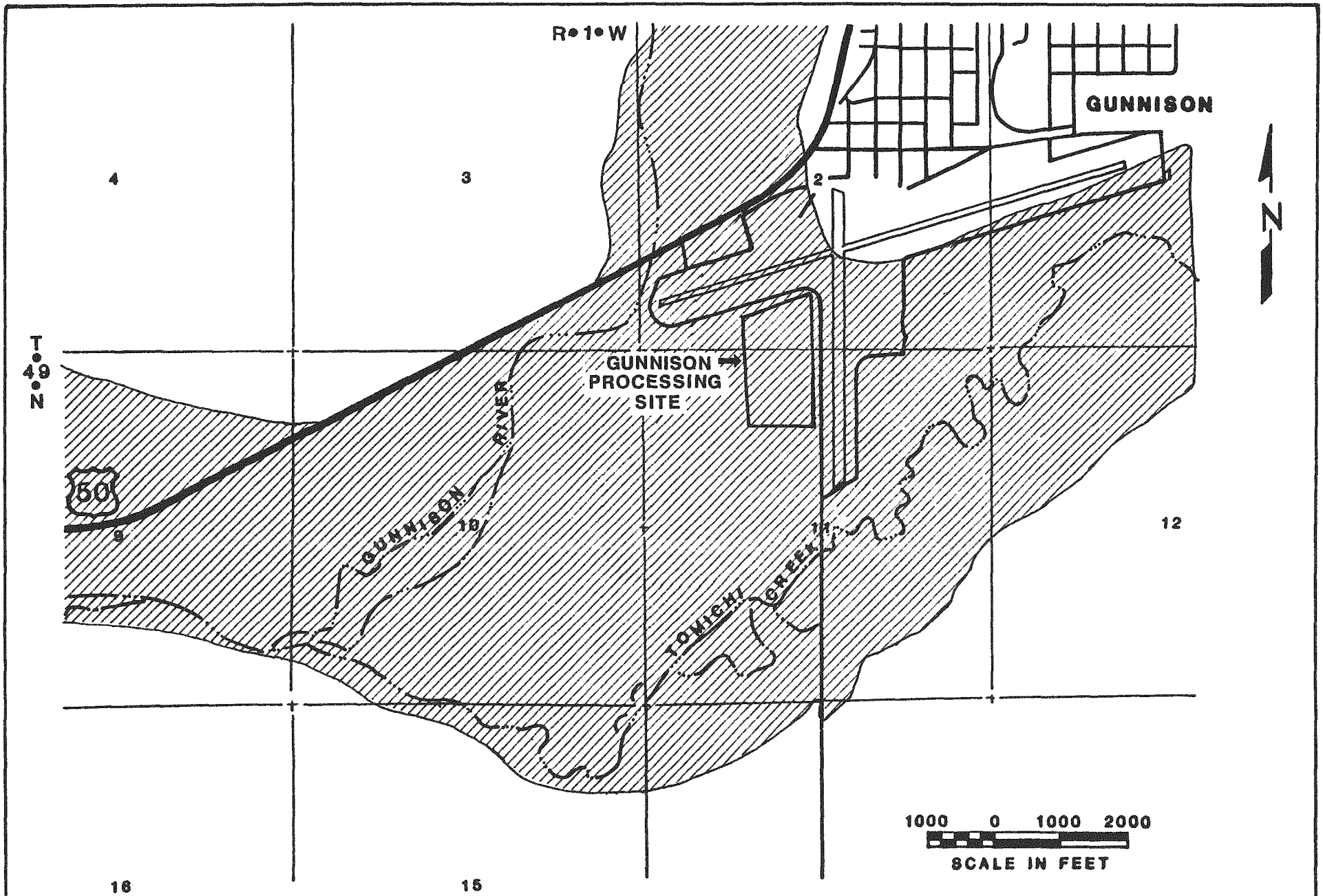

FIGURE 2.2

PMP/PMF FLOODPLAIN FOR THE GUNNISON RIVER AND TOMICHI CREEK NEAR GUNNISON, COLORADO

REF : ECI, 1976

Table 2.2 Probable Maximum Flood (PMF)

Location	Maximum discharge (cfs)
Gunnison River above confluence	291,000
Tomichi Creek above confluence	235,000
Gunnison River at confluence	514,000

The HEC-2 program was used to predict flow velocities, water surface elevations, and floodplain boundaries of the rivers in the vicinity of the processing site. If a PMF were to occur, 85 percent of the Gunnison River would overflow its bank toward Tomichi Creek and inundate the processing site. Flow velocity in the Gunnison River near the pile would average 18 feet per second (fps). Combined flow from Tomichi Creek and the Gunnison River would inundate a portion of Gold Basin Road and about 2500 feet of the Gunnison bypass haul road located south of the Gunnison County Airport (Figure 2.2).

To determine whether the results of the flood study were conservative, the flow rates used in the model were compared to existing streamflow data, and with flow rates determined by other statistical methods. As predicted by Crippen and Bue (1977), the Regional Maximum flood (RMF) discharge of the Gunnison River is 210,000 cfs. The Gunnison River flow rate used in this study was 291,000 cfs, or 1.4 times the RMF flow rate. The flow rate used to analyze flooding of Tomichi Creek is also extremely conservative. For example, the flow rate used in the HEC-2 program was 121 times the maximum recorded flow of the creek.

Landfill disposal site

Flooding would not be a hazard at the Landfill disposal site. Tomichi Creek is the closest perennial stream; however, it is located 8000 feet north of the site and has a streambed elevation 240 feet below the lowest point on the disposal cell; in addition, migration of Tomichi Creek would not affect the cell.

Borrow sites

The Sixmile Lane and Chance Gulch borrow sites would not be affected by the flooding of Tomichi Creek because of the distance from, and elevation above, the streambed.

3.0 WETLANDS EFFECTS

3.1 DESCRIPTION OF WETLANDS

Wetlands as defined in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands are "areas that under normal circumstances have hydrophytic vegetation, hydric soils, and wetland hydrology (Federal Interagency Committee for Wetland Delineation, 1989). The identification and delineation of wetlands at the Gunnison site was consistent with the above-mentioned manual.

Wetland areas are present within the designated processing site boundary and adjacent windblown area (Figure 3.1), along Gold Basin Road, and around a spring that is near the Tenderfoot Mountain haul road (Figure 3.2). The COE surveyed all potential wetland areas in 1989 and 1990 and determined that wetlands at the processing site, in the windblown area adjacent to the processing site, and adjacent to a spring near the haul road in Section 19, T49N, R1E, New Mexico Principal Meridian are regulated by the COE. The riparian area dominated by cottonwoods found along the western and southern boundaries of the processing site did not qualify as COE-regulated wetlands because appropriate soil characteristics were not present (Jacobson, 1990; 1989).

The wetlands at the western end of the designated site boundary consist of two grass-dominated wet meadows (Figure 3.1). One area is dominated by manna grass (Glyceria sp.) and sedges (Carex sp.); water parsnip (Sium suave) is also common. The second area is dominated by sloughgrass (Beckmannia syzigachne). These wetlands are apparently the result of a leaky irrigation ditch.

The wetlands in the windblown contaminated area consist of a strip of shrub-dominated wetlands between Gold Basin Road and the dirt runway for the Gunnison County Airport. Willow (Salix sp.) is the dominant species and occurs in dense stands in this area. Immature narrowleaf cottonwood (Populus angustifolia) is also common in this area. These trees are typically five to 15 feet tall. The ground cover is dominated by grass and the growth is sparse in dense stands of willow to dense in more open areas.

The wetlands crossed by the Tenderfoot Mountain haul road parallel to Gold Basin Road and Tomichi Creek are wet meadows dominated by grass, with sedges (Carex sp.) and rushes (Juncus sp.) also common. The wetlands along the spring area are also wet meadows. The dominant vegetation is rush; other species observed include yarrow (Achillea millefolium), marsh gentian (Gentiana affines), and Aster sp. The wetlands adjacent to the spring are on BLM land.

Wildlife use of these wetlands would be expected to be similar to wildlife use of surrounding wetlands. Species such as the leopard frog, tiger salamander, garter snake, red-winged blackbird, Brewer's blackbird, masked shrew, western jumping mouse, and muskrat would be expected to occur in these areas. Waterfowl, shorebirds, and wading birds also use the wetland habitat. The mallard (Anas platyrhynchos), teal (Anas sp.), Canada

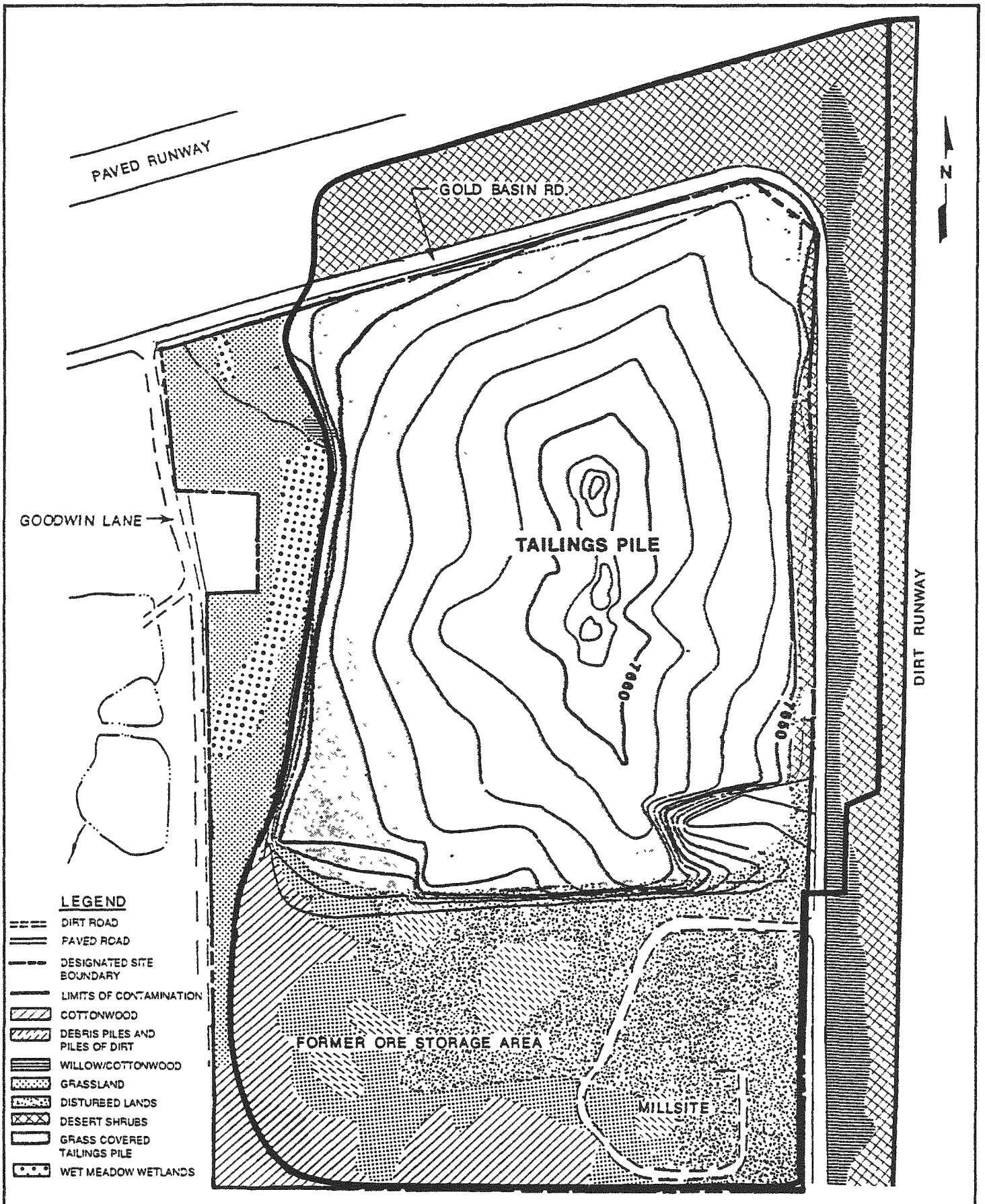

FIGURE 3.1
PLANT COMMUNITIES ON THE
GUNNISON PROCESSING SITE, NEAR GUNNISON, COLORADO

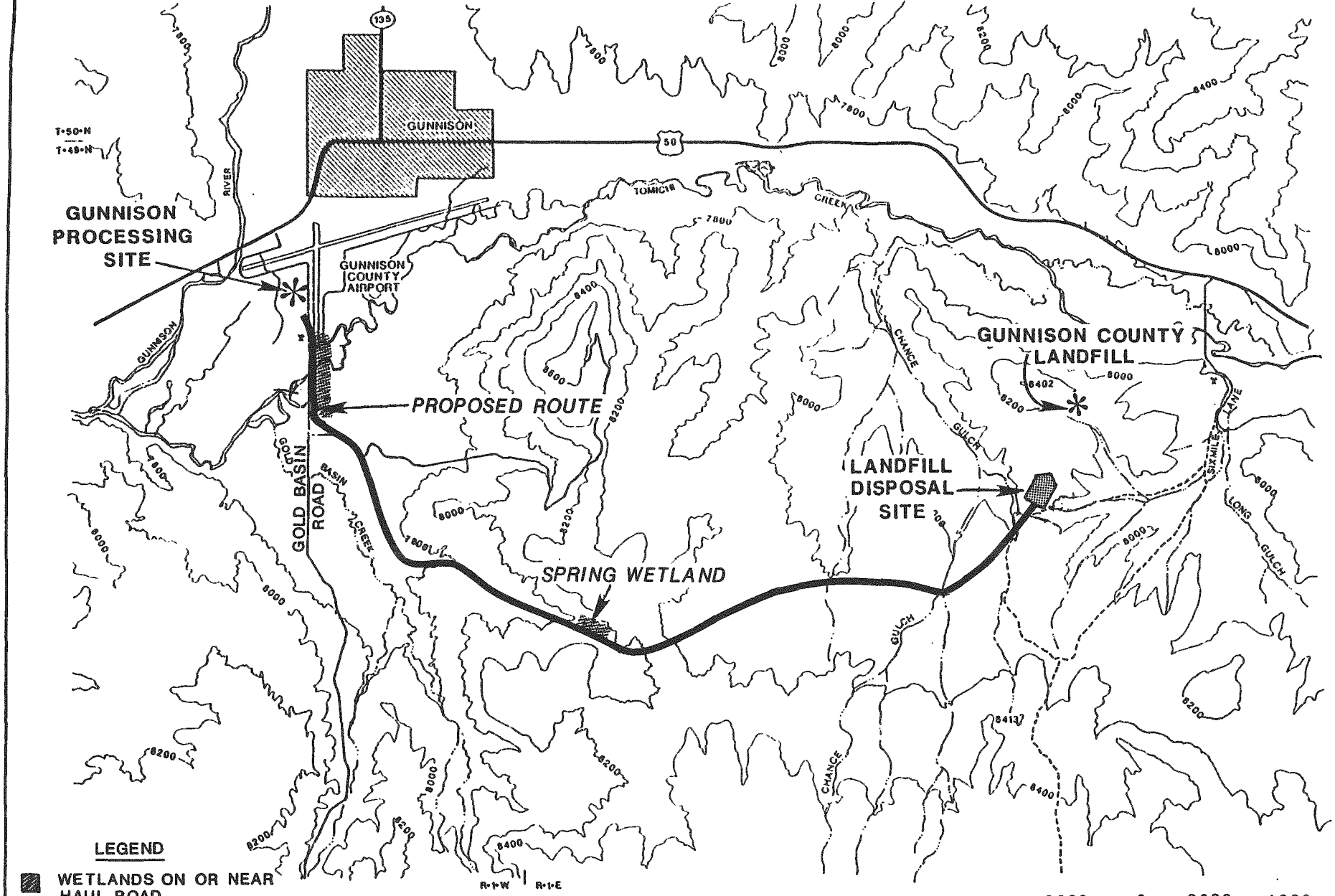

FIGURE 3.2
LOCATION OF WETLANDS ALONG THE TENDERFOOT MOUNTAIN HAUL ROAD

Attachment 1

goose (Branta canadeusis), snipe (Capella gallinago), and spotted sandpiper (Actitis macularia) have been observed. The endangered whooping crane (Grus americana) and Federal candidate white-faced ibis (Plegadis chihi) also use the area. See Attachment 2 of the environmental assessment, Biological Assessment, for more details regarding threatened and endangered species.

3.2 IMPACTS ON WETLANDS

Supplemental standards would be applied to the two acres of COE-regulated wetlands in the windblown contaminated area adjacent to the processing site. These wetlands would not be impacted.

The wetlands at the west end of the designated site boundary would be impacted by the realignment of Goodwin Lane (see Figure 3.4) and the relocation of the irrigation ditch. These activities would result in the elimination of 1.7 acres of wetlands in this area.

The proposed Tenderfoot Mountain haul road would require new road construction parallel and east of Gold Basin Road to a turn-off that would access the Tenderfoot Mountain road. Wetlands are found along the 0.8 mile long segment next to Gold Basin Road. Assuming a 40-foot-wide disturbance zone, then 3.9 acres of wet meadow wetlands would be cleared. Approximately 0.5 acre of regulated wetlands would be impacted along the Tenderfoot Mountain haul road, just east of Gold Basin Road. The haul road also passes by a spring on BLM land, but the wetlands at this spring would not be impacted. An estimated 4.4 acres of wetlands would be affected by the road construction along the Tenderfoot Mountain haul road.

The clearing of a total of 6.1 acres of wetlands during remedial action would constitute an unavoidable impact. Wetlands are generally much more productive in terms of plants and wildlife than the surrounding upland plant communities (Szaro and Jakle, 1985; Johnson and Carothers, 1982). The clearing of these wetlands would reduce wildlife use to essentially zero. Clearing of this vegetation would result in the destruction of less mobile wildlife, such as small mammals and reptiles, and the displacement of larger mammals and birds from the affected areas. The displaced wildlife could be forced to compete with resident wildlife for habitat or to inhabit marginal habitat, resulting in a reduced survivorship for the displaced wildlife.

3.3 ALTERNATIVES

An alternate route segment that traversed private land east and south of the county airport perimeter service road was evaluated and subsequently dropped from further consideration. An estimated 2.7 acres of COE-regulated wetlands would be crossed using this route. However, these wetlands are relatively undisturbed and away from human activity, which gives them greater value to wildlife than wetlands along Gold Basin Road.

3.4 MITIGATION OF IMPACTS ON WETLANDS

Wetland habitat may be created elsewhere to mitigate the loss of the affected wetlands along the haul route. The final mitigative measures for the loss of wetlands will be identified in the 404 permit issued by the COE. This may include but not be limited to creating wet meadow wetlands and/or revegetation of riparian habitats with pole plantings (Swenson and Mullins 1985; York, 1985). Cottonwood and willow, which are the two major species growing in the shrub-dominated wetlands at the Gunnison site, have been successfully established from pole plantings. If possible, cuttings from vegetation growing near the disturbed land should be obtained. For best results, it is recommended that the following procedures be followed:

- Cuttings should be from dormant plants.
- Pole plantings need to extend into the groundwater. If the groundwater fluctuates on an annual basis, the plantings should be deep enough so they are in the groundwater at all times.
- Poles should be cut on an angle at the root end and flat on the top end.
- Poles should be at least six to seven feet long and three to six inches in diameter.
- Poles should be placed in a barrel of water while being held for planting.
- All cut surfaces that extend above the ground should be sealed.

The following problems have been encountered with this technique:

- Flooding of pole plantings for greater than three weeks results in high mortality.
- Beaver can cut the living poles at ground level and the subsequent low sprouting growth can be grazed by livestock.
- Cattle are able to trample down pole planting if the poles are too small.
- Cattle also graze new growth, so poles need to be tall enough so livestock cannot reach all the new growth.

If beaver and livestock activities are controlled, pole plantings can be very successful. In one study, 95 percent of all the plantings survived the first season. All cottonwood plants died back to a certain degree and by the second growing season, willows were putting on intense side growth (York, 1985). In another study, survival of pole plantings that were constantly within the water table ranged from 73 to 100 percent (Swenson and Mullins, 1985).

The successful revegetation of the wetland plant communities at the Gunnison site would result in plant communities that are similar to the ones that presently exist.

Other mitigative measures that would be taken include:

- Recontouring excavated areas to create favorable conditions for the reestablishment of riparian wetland vegetation.
- Selected use of water bars, mulch, riprap, or other soil-erosion controls to minimize erosion.

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ATTACHMENT 2 BIOLOGICAL ASSESSMENT

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1.0 INTRODUCTION

Pursuant to the Uranium Mill Tailings Radiation Control Act of 1978, the U.S. Department of Energy (DOE) is conducting a remedial action program designed to clean up the residual radioactive materials at a site near Gunnison, Colorado (Figure 1.1). An important part of the environmental assessment of the remedial action is the consideration of Federally listed threatened, endangered, or candidate wildlife and plant species that may be affected by the project. This biological assessment presents the results of an analysis of the potential for these species to occur on or near the Gunnison processing, disposal, and borrow sites or along proposed haul roads. The species considered in this biological assessment were determined through consultation with the U.S. Fish and Wildlife Service (FWS). This biological assessment was prepared to comply with Section 7 of the Endangered Species Act of 1973 as amended and is attached to the environmental assessment consistent with regulations (50 CFR 402.06) for the implementation of Section 7 of the Endangered Species Act.

In July 1984 the FWS provided a list of species that may occur near the Gunnison site (Appendix A). This list was updated in April and December 1988 (Appendix A), and a third time in March 1990 during verbal communication with the FWS in Grand Junction, Colorado (Anderson, 1990; Leachman, 1990). This assessment includes descriptions of the proposed action, the ecological setting at the Gunnison tailings site, the historical and current status of the species of concern at the site, and a finding as to whether the remedial action would affect the species.

On December 11, 1990, the FWS completed their Biological Opinion regarding remedial actions at the Gunnison site (Appendix B). Their opinion agreed with the determinations in the Biological Assessment regarding project-related impacts on threatened and endangered species except that the FWS requested that the DOE determine if remedial actions would likely jeopardize the continued existence of the razorback sucker. In a letter dated February 7, 1991 (part of Appendix B), the DOE determined that remedial actions at the Gunnison site would not jeopardize the continued existence of the razorback sucker, to which the FWS agreed in a letter dated February 25, 1991 (the letter is part of Appendix B).

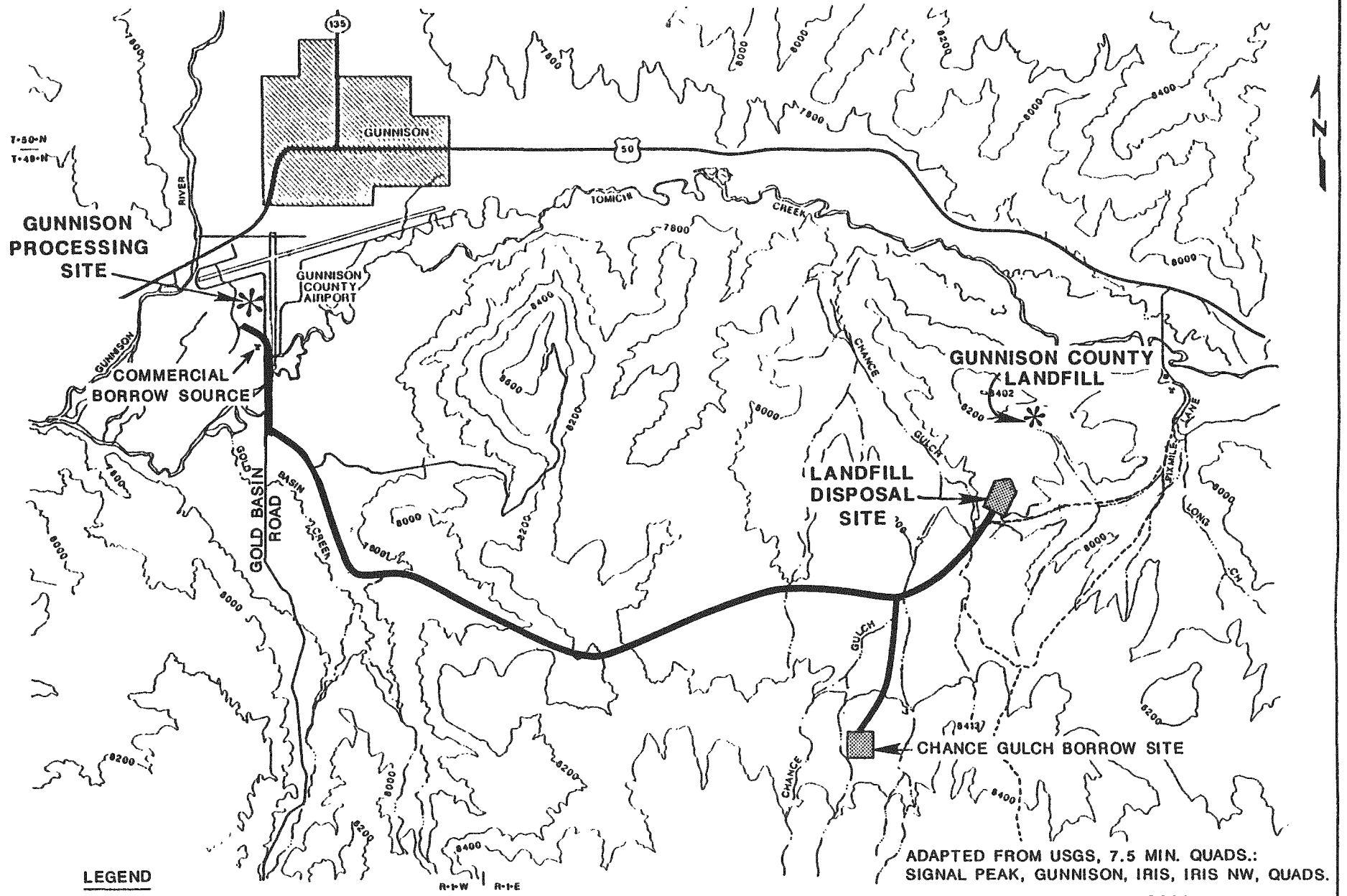

FIGURE 1.1
LOCATIONS OF THE GUNNISON PROCESSING, DISPOSAL AND BORROW SITES, AND TRANSPORTATION ROUTE NEAR GUNNISON, COLORADO

2.0 DESCRIPTIONS OF THE PROPOSED ACTION AND STUDY AREA

2.1 PROPOSED ACTION

The proposed action is to consolidate and remove all contaminated materials associated with the Gunnison processing site to a location east of Gunnison called the Landfill disposal site (see Figure 1.1). The total amount of contaminated material at the Gunnison processing site is 718,900 cubic yards. These materials cover 68 acres.

The contaminated materials would be transported via the Tenderfoot Mountain haul road to the Landfill disposal site and then covered with an approximately 9-foot-thick multicomponent cover that would inhibit radon emanation from and water infiltration into the disposal cell. These materials would be primarily obtained from the Sixmile Lane and Chance Gulch borrow sites (see Figure 1.1). Materials from on-site excavation and a commercial borrow source would also be used.

The amount of land disturbed at all work sites is estimated to be 341 acres. Sixty-eight acres would be disturbed at the processing site, 122 acres at the Landfill disposal site, 60 acres at the Sixmile Lane borrow site, 30 acres at the Chance Gulch borrow site, 9.0 acres along the borrow site haul routes, and 52 acres along the haul road. Remedial action would take place over a three-year period, which includes two six-month winter shutdowns.

2.2 STUDY AREA

The Gunnison processing site, Landfill disposal and borrow sites, and haul road are in the Great Basin sagebrush habitat of the Southern Rocky Mountain zone (Kuchler, 1975). The Gunnison processing site is in the floodplains of the Gunnison River and Tomichi Creek; the Landfill disposal site and two of the proposed borrow sites are in sagebrush habitat on land administered by the Bureau of Land Management (BLM). One commercial gravel operation would be used for additional borrow materials and will not be discussed further because it is already disturbed.

Information regarding the flora and fauna in the areas to be affected was derived from field reconnaissance surveys (TAC, 1990a, 1989, 1988, 1986, 1985; EES, 1986; DOE, 1983); consultation with natural resource personnel from state and Federal agencies; and a review of the pertinent literature. Lists of flora and fauna observed or expected to occur, and scientific names of most species referred to in the text, appear in Tables 2.1 through 2.4. These tables do not represent a complete listing of species from the area. Rather, they are species observed during brief reconnaissance surveys or species recorded in the area from other sources. The plant and bird species lists (Tables 2.1 and 2.3) for the Landfill site were derived from surveys conducted three miles west of the Landfill site and south of Tenderfoot Mountain (EES, 1986; TAC 1986, 1985) and from site-specific surveys (TAC, 1990a, 1989, 1988). The amphibian, reptile (Table 2.2), and mammal species (Table 2.4) lists were generated from limited site-specific data and other sources as referenced in the tables.

Table 2.1 Plant species observed at the Gunnison processing site and in the sagebrush plant community near the Landfill disposal site, Gunnison, Colorado

Scientific name	Common name	Gunnison processing site	Landfill disposal site
	GRASSES		
Agropyron cristatum	crested wheatgrass	X	X
Agropyron repens	quackgrass	X	
Agropyron riparium	wheatgrass	X	X
Agropyron smithii	Smith's wheatgrass		X
Agropyron spicatum	bluebunch wheatgrass	X	
Agrostis alba	redtop bentgrass	X	
Aristida purpurea	red threeawn	X	X
Bouteloua gracilis	blue grama	X	X
Bromus inermis	smooth brome	X	X
Bromus polyanthus	polyanthus brome	X	X
Bromus tectorum	cheatgrass	X	X
Elymus condensatus	giant wild rye	X	X
Elymus glaucus	blue wild rye	X	X
Hordeum jubatum	foxtail barley	X	X
Koeleria cristata	junegrass	X	X
Muhlenbergia asperifolia	scratch grass	X	X
Oryzopsis hymenoides	Indian ricegrass	X	X
Phleum pratense	timothy grass	X	X
Poa agassizensis	rhizomatous bluegrass	X	X
Poa nervosa	wheeler bluegrass	X	X
Poa pratensis	bluegrass	X	X
Sitanion hystrix	bottlebrush squirreltail	X	X
Sitanion longifolium	squirreltail	X	X
Sporobolus airoides	alkali sacaton	X	X
Sporobolus cryptandrus	sand dropseed	X	X
Stipa comata	needle and thread	X	X
Stipa lettermanii	Letterman's needlegrass	X	X
Stipa occidentalis	western needlegrass	X	X
Stipa pinetorum	pine needlegrass	X	X
	TREES AND SHRUBS		
Abies lasiocarpa	alpine fir		X
Amelanchier alnifolia	serviceberry		X
Artemisia frigida	fringed sagebrush	X	X
Artemisia ludoviciana	sagebrush		X
Artemisia nova	black sagebrush		X
Artemisia tridentata	big sagebrush	X	X
Atriplex canescens	four-winged saltbush	X	X
Cercocarpus montanus	mountain mahogany		X

Table 2.1 Plant species observed at the Gunnison processing site and in the sagebrush plant community near the Landfill disposal site, Gunnison, Colorado (Continued)

Scientific name	Common name	Gunnison processing site	Landfill disposal site
	TREES AND SHRUBS (Continued)		
Chrysothamnus nauseosus	rubber rabbitbrush	X	X
Chrysothamnus viscidiflorus	rabbitbrush	X	X
Eurotia lanata	winter-fat		X
Gutierrezia sarothrae	broom snakeweed	X	X
Opuntia erinacea	Utah prickly pear cactus	X	X
Pediocactus simpsonii	mountain cactus		X
Populus angustifolia	narrowleaf cottonwood	X	
Purshia tridentata	antelope bitterbrush		X
Rhus trilobata	squawbush	X	X
Ribes cereum	gooseberry	X	X
Rosa woodsii	wild rose		X
Rubus strigosus	western red raspberry	X	X
Symphoricarpos oreophilus	snowberry		X
Tetradymia canescens	horsebrush		X
Yucca glauca	soapweed	X	X
	FORBS		
Achillea lanulosa	yarrow	X	X
Agoseris glauca	false dandelion	X	X
Amaranthus albus	tumble pigweed	X	
Androsace septentrionalis	rock-jasmine		X
Anemone patens	pulsatilla		X
Antennaria parvifolia	pussytoes	X	X
Antennaria rosea	pink pussytoes		X
Arabis crandallii	rockcress		X
Arabis holboellii	rockcress		X
Arabis lignifera	rockcress		X
Asclepias speciosa	milkweed	X	X
Aster sp.	aster	X	X
Aster chilensis	pacific aster	X	
Astragalus anisus	milkvetch		X
Astragalus convallarius	milkvetch		X
Astragalus miser	limber milkvetch		X
Bassia hyssopifolia	smotherweed	X	
Camelina microcarpa	camelina		X
Carex festivella	sedge	X	
Carex spp.	sedge	X	
Castilleja chromosa	Nelson's indian paintbrush	X	X
Castilleja integra	indian paintbrush	X	X
Chaenactis douglasii	Douglas' dusty maiden	X	X
Chenopodium fremontii	Fremont's goosefoot	X	X

Table 2.1 Plant species observed at the Gunnison processing site and in the sagebrush plant community near the Landfill disposal site, Gunnison, Colorado (Continued)

Scientific name	Common name	Gunnison processing site	Landfill disposal site
	FORBS (Continued)		
Chenopodium leptophyllum	shinleaf goosefoot	X	
Cirsium arvense	Canada thistle	X	
Crepis modocensis	hawksbeard	X	X
Cryptantha bakeri	cryptantha		X
Cymopterus bulbosus	biscuitroot		X
Descurainia richardsonii	tansy mustard	X	X
Descurainia sophia	tansy mustard		X
Equisetum arvense	horsetail	X	
Erigeron eatonii	Eaton fleabane	X	
Erigeron pumilus	fleabane	X	X
Eriogonum cernuum	wild buckwheat	X	X
Eriogonum lonchophyllum	wild buckwheat	X	X
Eriogonum racemosum	wild buckwheat	X	X
Eriogonum umbellatum	wild buckwheat	X	X
Erodium cicutarium	filaree	X	X
Erysimum asperum	erysimum	X	X
Erysimum robusta	small spurge	X	X
Fragaria ovalis	wild strawberry	X	X
Galium multiflorum	galium		X
Gayophytum ramosissimum	gayophytum		X
Gentiana sp.	gentian	X	
Geum sp.	avens	X	X
Gilia aggregata	gilia	X	X
Gilia calcarea	gilia	X	X
Grindelia squarrosa	curlycup gumweed	X	
Heterotheca villosa	golden aster	X	X
Heuchera parvifolia	alumroot		X
Hymenopappus filifolius	hymenopappus	X	X
Hymenoxys acaulis	actinea	X	X
Hymenoxys richardsonii	actinea	X	X
Iris missouriensis	wild iris	X	
Juncus sp.	rush	X	
Kochia scoparia	summer cypress	X	
Lactuca serriola	prickly lettuce	X	
Lappula texana	stickseed	X	
Lemna minor	common duckweed	X	
Lepidium densiflorum	prairie pepperweed	X	
Lepidium montanum	mountain pepperweed	X	X
Lepidium perfoliatum	clasping pepperweed	X	X
Leptodactylon pungens	leptodactylon		X
Lesquerella montana	bladderpod	X	X
Leucelene ericoides	rose heath		X

Table 2.1 Plant species observed at the Gunnison processing site and in the sagebrush plant community near the Landfill disposal site, Gunnison, Colorado (Concluded)

Scientific name	Common name	Gunnison processing site	Landfill disposal site
	FORBS (Continued)		
Linaria vulgaris	butter and eggs	X	X
Linum lewisii	flax	X	X
Lithospermum incisum	pucoon		X
Lupinus argenteus	lupine		X
Lupinus brevicaulis	lupine		X
Machaeranthera canescens	machaerantha	X	X
Machaeranthera linearis	lime machaerantha	X	X
Medicago sativa	alfalfa	X	
Melilotus alba	white sweet clover	X	
Melilotus officinalis	yellow sweet clover	X	
Mentha arvensis	field mint	X	
Monolepis nuttalliana	patata	X	X
Oenothera caespitosa	evening primrose	X	X
Orobanche fasciculata	clustered broomrope	X	X
Oxytropus deflexa	crazyweed	X	X
Phlox multiflora	phlox	X	
Phlox muscoides	phlox	X	
Physaria acutifolia	twinpod	X	
Plantago major	plantain	X	X
Polygonum aviculare	prostrate knotweed	X	
Portulaca oleracea	common purselane	X	
Potentilla anserina	cinquefoil	X	X
Potentilla biennis	biennial cinquefoil	X	X
Rumex crispus	curly dock	X	
Salsola kali	Russian thistle	X	
Schoencrambe linifolia	schoencrambe	X	X
Selaginella densa	selaginella	X	X
Senecio mutabilis	groundsel	X	X
Sisymbrium altissimum	tumble mustard	X	
Solidago canadensis	Canada goldenrod	X	
Sphaeralcea coccinea	globemallow	X	X
Streptanthus cordatus	twistflower	X	X
Taraxacum officinale	dandelion	X	X
Thelypodium integrifolium	thelypodium	X	X
Thermopsis montana	golden banner		X
Tragapogon dubius	goatsbeard	X	
Trifolium longipes	clover	X	
Trifolium pratense	clover	X	
Vicia americana	American vetch	X	

Ref. EES, 1986; DOE, 1983.

Table 2.2 Amphibians and reptiles expected to occur at or near the Gunnison processing site and Landfill disposal site, Gunnison, Colorado

Scientific name	Common name	Gunnison processing site	Landfill disposal site
Ambystoma tigrinum[a]	tiger salamander	X	X
Bufo boreas[a]	western toad	X	X
Bufo woodhousii[a]	Woodhouse's toad	X	X
Pseudocris triseriata[a]	striped chorus frog		X
Rana pipiens[a]	northern leopard frog		X
Phrynosoma douglassii	short-horned lizard	X	X
Sceloporus graciosus	sagebrush lizard		X
Sceloporus undulatus	eastern fence lizard	X	X
Pituophis melanoleucus	bullsnake	X	X
Thamnophis elegans	western terrestrial garter snake	X	

[a]Species would most likely occur in wetland/riparian habitat.

Ref. Hammerson, 1986; CDM, 1981.

Table 2.3 Bird species observed at or in the area of the Gunnison processing site and in the sagebrush habitat in the area of the Landfill disposal site, Gunnison, Colorado

Scientific name	Common name	Gunnison processing site[a]	Landfill disposal site
Ardea herodias	great blue heron	X	
Branta canadensis	Canada goose	X	
Anas platyrhynchos	mallard	X	
Anas americana	American wigeon	X	
Anas clypeata	northern shoveler	X	
Anas discors	blue-winged teal	X	
Fulica americana	American coot	X	
Charadrius vociferus	killdeer	X	X
Actitis macularia	spotted sandpiper	x	
Phalaropus tricolor	Wilson's phalarope	X	
Gallinago gallinago	common snipe	X	
Aquila chrysaetos	golden eagle		X
Buteo swainsoni	Swainson's hawk	X	
Falco sparverius	American kestrel	X	
Centrocercus urophasianus	sage grouse	X	X
Zenaida macroura	mourning dove	X	X
Phalaenoptilus nuttallii	common poorwill	X	X
Chordeiles minor	common nighthawk	X	X
Ceryle alcyon	belted kingfisher	X	
Colaptes auratus	northern flicker	X	
Syhyrapicus thyroideus[b]	Williamson's sapsucker		
Tyrannus verticalis	western kingbird	X	
Contopus sordidulus	western wood pewee	X	
Eremophila alpestris	horned lark	X	X
Tachycineta thalassina	violet-green swallow	X	
Hirundo pyrrhonota	cliff swallow	X	
Hirundo rustica	barn swallow	X	
Pica pica	black-billed magpie	X	X
Corvus corax	common raven	X	X
Parus atricapillus	black-capped chickadee	X	
Troglodytes aedon	House wren	X	
Sialia currucoides[b]	mountain bluebird		
Turdus migratorius	robin	X	
Oreoscoptes montanus	sage thrasher		X
Sturnus vulgaris	european starling	X	
Dendroica petechia[b]	yellow warbler	X	
Pipilo chlorurus	green-tailed towhee		X
Junco hyemalis	northern junco	X	
Pooecetes gramineus	vesper sparrow	X	X
Ammodramus savannarum	grasshopper sparrow	X	X
Melospiza melodia	song sparrow	X	
Chondestes grammacus	lark sparrow	X	X
Amphispiza belli	sage sparrow		X

Table 2.3 Bird species observed at or in the area of the Gunnison processing site and in the sagebrush habitat in the area of the Landfill disposal site, Gunnison, Colorado (Concluded)

Scientific name	Common name	Gunnison processing site[a]	Landfill disposal site
Zonotrichia leucophrys	white-crowned sparrow	X	X
Spizella breweri	Brewer's sparrow	X	X
Sturnella neglecta	western meadowlark	X	X
Xanthocephalus xanthocephalus	yellow-headed blackbird	X	
Agelaius phoeniceus	red-winged blackbird	X	
Euphagus cyanocephalus	Brewer's blackbird	X	

[a]Includes species in nearby wetlands at Tomichi Creek and along proposed haul road routes.
[b]Species which occur in small wooded areas near the Landfill disposal site and the borrow sites.

Ref. TAC, 1990a, 1989, 1988, 1986, 1985; CDM, 1981.

Table 2.4 Mammals observed or expected to occur at the Gunnison processing site and in the sagebrush habitat in the area of the Landfill disposal site, Gunnison, Colorado

Scientific name	Common name	Gunnison processing site	Landfill disposal site
Sorex cinereus[a]	masked shrew		X
Sorex merriami	Merriam's shrew	X	X
Sorex vagrans	wandering shrew		X
Myotis yumanensis	yuma myotis	X	X
Myotis californicus	California myotis	X	X
Tadarida braziliensis	Brazilian free-tailed bat		X
Sylvilagus nuttallii	mountain cottontail	X	X
Sylvilagus audubonii	desert cottontail	X	X
Lepus townsendii	white-tailed jackrabbit	X	X
Eutamias minimus	least chipmunk	X	X
Spermophilus richardsonii	Richardson's ground squirrel	X	X
Spermophilus variegatus	rock squirrel		X
Thomomys talpoides	northern pocket gopher	X	X
Perognathus flavus	silky pocket mouse	X	X
Dipodomys ordii	Ord's kangaroo rat	X	X
Castor canadensis[a]	beaver	X	
Peromyscus maniculatus	deer mouse	X	X
Microtus montanus[a]	montane vole	X	
Microtus longicandus[a]	long-tailed vole	X	
Lagurus curtatus	sagebrush vole		X
Ondatra zibethicus[a]	muskrat	X	
Zapus princeps[a]	western jumping mouse	X	
Erethizon dorsatum[a]	porcupine	X	
Canis latrans	coyote		X
Urocyon cinereoargenteus	gray fox		X
Proayon lotor[a]	raccoon	X	X
Mustela frenata[a]	long-tailed weasel	X	X
Mustela vison[a]	mink	X	
Taxidea taxus	badger		X
Spilogale gracilis	western spotted skunk	X	X
Mephitis mephitis	striped skunk	X	X
Felis rufus	bobcat		X
Cervus elaphus	elk		X
Odocoileus hemionus	mule deer	X	X
Antilocapra americana	pronghorn antelope	X	

[a]Species typical of wetland and riparian areas.

Ref. Bernard and Brown, 1978.

Gunnison processing site

The Gunnison processing site includes the tailings pile, former ore storage and mill site areas, miscellaneous areas within the designated site, and the surrounding windblown contaminated area. Most of the land within the site boundary was disturbed during milling operations. After operations ceased, the tailings pile was covered with soil and reseeded. The pile is now grass-covered; big sagebrush is scattered over most of the pile and reaches its maximum growth along the south, east, and west borders of the pile. The remainder of the designated site is a mosaic of plant community types varying from highly disturbed land with early successional plant species to an immature growth of cottonwood (Figure 2.1). Early successional species such as yellow sweet clover and Russian thistle are the most common. Scattered stands of big sagebrush and narrowleaf cottonwood are also present. A dense growth of immature narrowleafed cottonwood trees occurs along the western edge of the site. Grass-covered areas also occur, with western wheatgrass being the most common species (TAC, 1989).

The plant communities in the windblown contaminated areas to the north and east of the site are desert shrub and shrub wetlands. Big sagebrush is the most common shrub species in the desert shrub community and grows as scattered individuals or in clumps (TAC, 1989). Rabbitbrush is also present and grass and herbs are the dominant ground cover. Willow is the most common species in the wetland habitat and occurs in fairly dense stands in some areas. Small (five to 15 feet) narrowleaf cottonwood trees are also common in this area. The wetland habitat has dense ground cover in the form of grass (TAC, 1989).

Brief reconnaissance surveys for wildlife were conducted in the processing site area. No reptiles or amphibians were observed; however, seven species, including the short-horned lizard, eastern fence lizard, and bullsnake, would be expected at the site (Table 2.2). Twenty-four species of mammals, including the cottontail, white-tailed jackrabbit, deer mouse, raccoon, and striped skunk, may occur at or near the site (Table 2.4). Surveys in 1990 resulted in the observation of an active prairie dog town at the northern end of the tailings pile; twenty burrows were observed (TAC, 1990a). The western meadowlark, red-wing blackbird, yellow warbler, and robin were common nesting birds at the processing site (Table 2.3).

Landfill disposal site, borrow sites, and haul routes

The Landfill disposal site, borrow sites, and most of the haul road are in a sagebrush-dominated plant community. Plant communities dominated by sagebrush occupy more area than any other plant community type in the Gunnison Basin; an estimated one-third of the basin is covered with sagebrush (BLM, 1980a). Big sagebrush has a variable growth form depending on site conditions. Big sagebrush on the dry south slopes is short, usually a foot or less in height, and has a canopy cover of less than 20 percent. Sagebrush on wetter sites is taller, typically over 20 inches high, and is not so widely spaced (canopy cover greater than 30 percent) (Hupp, 1987). Sagebrush along drainages will grow taller and denser than at other sites in the Gunnison Basin. An ecological study of a 1920-acre area in Chance Gulch west of the Landfill disposal site resulted in an

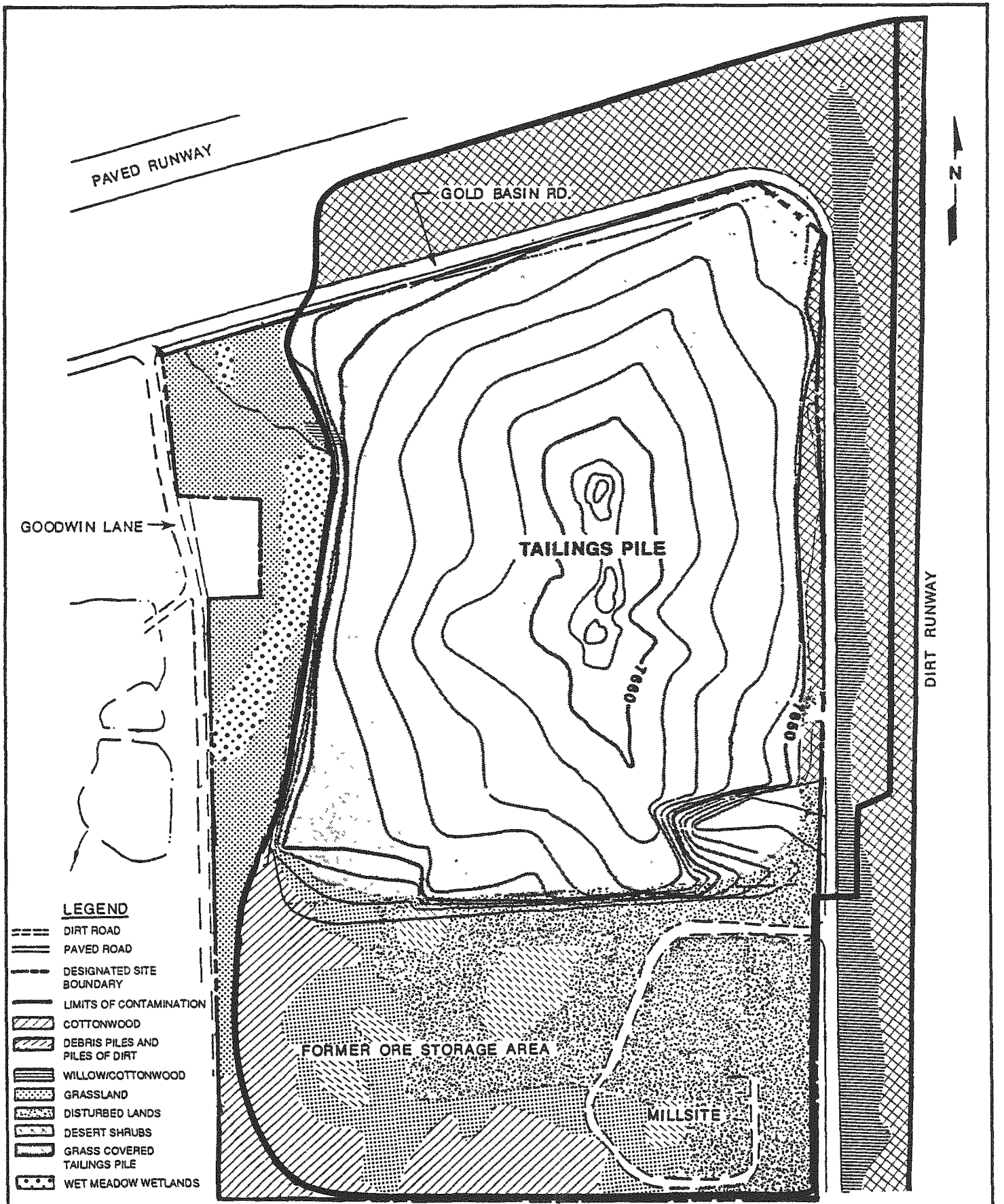

FIGURE 2.1
PLANT COMMUNITIES ON THE
GUNNISON PROCESSING SITE, NEAR GUNNISON, COLORADO

estimated total vegetative cover in big sagebrush habitat of 36.9 percent with the remainder being bare ground, rock, or litter. Big sagebrush accounted for most of the vegetative cover (77 percent); of the estimated 41,300 stems per hectare (16,700 per acre), big sagebrush comprised 95 percent (CDM, 1981). Other relatively common shrub species are rabbitbrush, broom snakeweed, and black sagebrush.

Dry grassland habitat occurred in small areas amidst the sagebrush habitat. It was most common on the upper south-facing slopes in the area but it was noted also in flat areas. These grassland areas were dominated by blue grama, western wheatgrass, squirreltail, indian ricegrass, Arizona fescue, and western needlegrass. Low-growing, widely scattered shrubs including big sagebrush, rabbitbrush, and winter-fat were also present (CDM, 1981).

Wildlife observations in the sagebrush plant community consisted of brief reconnaissance surveys. No reptiles or amphibians were observed. Species such as the desert short-horned lizard, northern sagebrush lizard, and northern plateau lizard would be expected in the sagebrush habitat (see Table 2.2).

A total of 18 species of birds were observed during one summer, one fall, and two spring surveys (TAC, 1989, 1988, 1986, 1985). The sage grouse, sage thrasher, sage sparrow, green-tailed towhee, and Brewer's sparrow were common nesting species in the sagebrush habitat. Species such as the mountain bluebird, yellow warbler, and northern flicker were observed in the small wooded areas in the general area of the Landfill site.

Mammals recorded in the Landfill disposal site area included the coyote, white-tail jackrabbit, and pronghorn antelope (TAC, 1990a, 1989, 1988, 1986, 1985). Other species typical of the sagebrush habitat include desert cottontail, least chipmunk, deer mouse, and striped skunk.

Mule deer, pronghorn antelope, and sage grouse are the major game species in the Landfill disposal site area. It is assumed that game species' use of the processing site area is limited due to the disturbed nature of the site area. A detailed discussion of game species at the Landfill disposal site, borrow sites, and along the TM haul road was prepared by the technical assistance contractor to the DOE (TAC, 1990b).

3.0 THREATENED AND ENDANGERED SPECIES

The determination of threatened and endangered (T&E) species that may occur at the Gunnison site was accomplished through consultation with the FWS as required in Section 7 of the Endangered Species Act. The FWS has identified the bald eagle (Haliaeetus leucocephalus), whooping crane (Grus americana), white-faced ibis (Plegadis chihi), long-billed curlew (Numenius americanus), western snowy plover (Charadrius hiaticula), black-footed ferret (Mustela nigripes), Colorado squawfish (Ptychocheilus lucius), humpback chub (Gila cypha), bonytail chub (Gila elegans),razorback sucker (Xyrauchen texanus), skiff milkvetch (Astragalus microcymbus), and Gunnison milkvetch (Astragalus anisus) as potentially occurring near the Gunnison processing site (Appendix A letters; Anderson, 1990, Leachman, 1990).

The black-footed ferret is listed as endangered by the FWS and the state of Colorado. No critical habitat has been designated. The ferret, primarily nocturnal, is closely associated with prairie dogs throughout its range. The ferret preys on prairie dogs and uses the prairie dog burrows as shelter and den sites. Because of this close association, all active prairie dog colonies are considered potential black-footed ferret habitat (Clark et al., 1984). A small prairie dog town was observed on the processing site (Figure 3.1); none were observed at the disposal site, borrow sites, or along haul routes. Due to the isolated, small size of the prairie dog town and highly disturbed nature of the area, black-footed ferrets would not be present and remedial action would not affect this species.

The bald eagle is listed as endangered by the FWS and the state of Colorado. The eagle is generally associated with river habitat where suitable perches and viable fisheries are available; large cottonwood trees are used for perching or roosting sites. The eagle feeds mainly on fish; however, carrion, waterfowl, and rabbits may also be consumed, especially during the winter. The bald eagle is not known to nest in the Gunnison Basin. Less than five wintering birds occur at Blue Mesa Reservoir and may sporadically use the Gunnison River and its tributaries including Tomichi Creek (BLM, 1980b). Areas of concentrated wintering bald eagle use, such as nocturnal roost sites, do not occur in the Gunnison area. Remedial action activities would not occur near any bald eagle use areas; therefore, these activities would not affect the bald eagle.

The whooping crane is listed as an endangered species by the Federal government and the state of Colorado. The species does not nest or winter in Colorado; it occurs in Colorado only during the spring and fall migrations. These birds migrate through the Gunnison area with sandhill cranes (Grus canadensis) and are typically in the Gunnison area for one or two weeks in mid-April and October. Two to three whooping cranes are usually observed during the migrations; they use the wet meadow habitat along Tomichi Creek (Speeze, 1990). This includes the wet meadow habitat that would be traversed by the Tenderfoot Mountain haul road.

Possible impacts to the whooping crane would include habitat loss and possible noise disturbance from haul trucks along the haul road. Construction of the haul road would result in the destruction of wetland habitat in the Tomichi Creek floodplain. While this impact would be permanent (road will remain in place), it would not affect whooping crane use of the Tomichi Creek floodplain because only a very small percent of this habitat would be used. Use of the haul

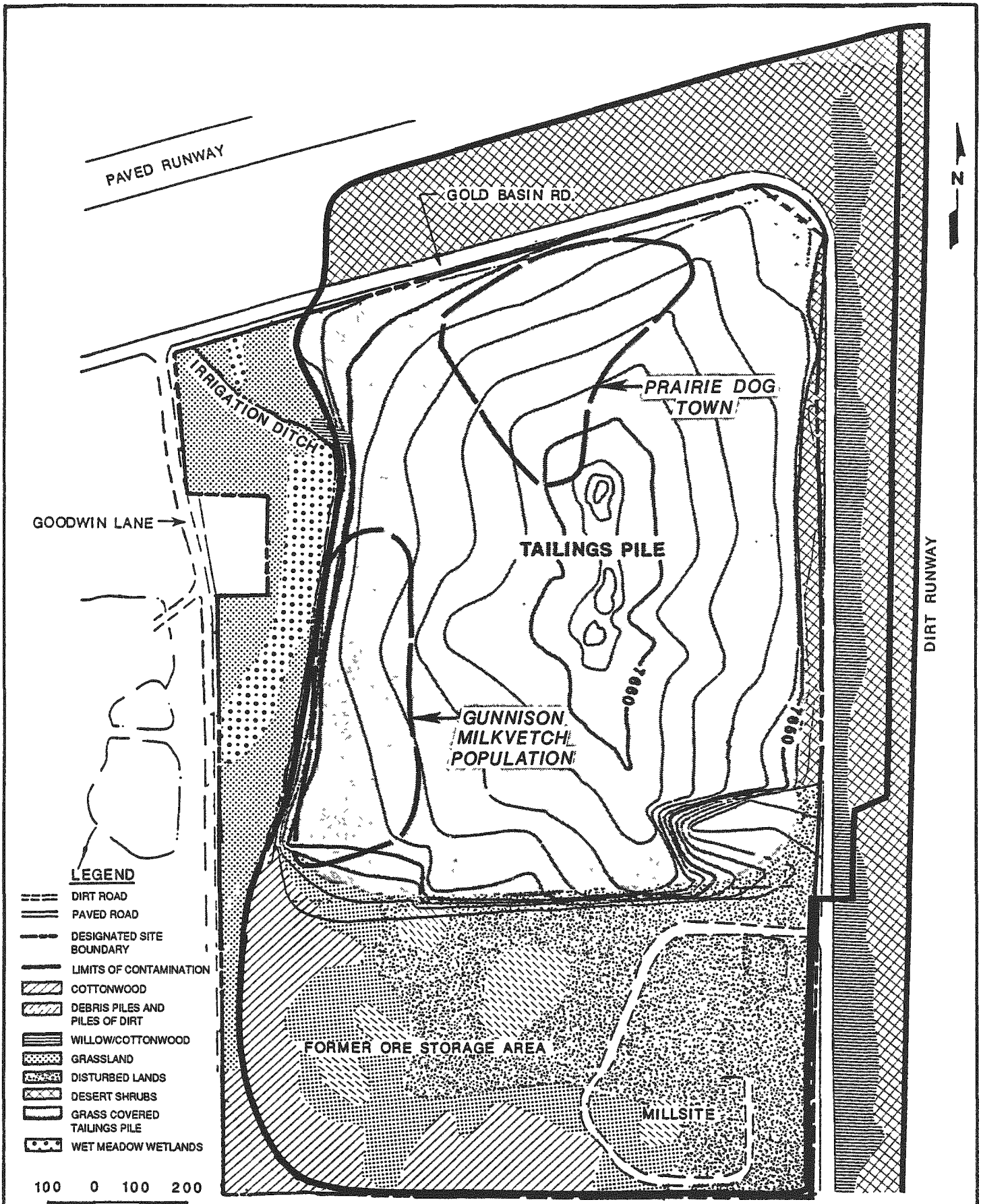

FIGURE 3.1
LOCATION OF PRAIRIE DOG TOWN AND GUNNISON MILKVETCH ON THE GUNNISON TAILINGS PILE, NEAR GUNNISON, COLORADO

road would not occur in April due to weather restrictions or possible restrictions placed on truck traffic and activity at the disposal site because of potential impacts to a sage grouse lek. Haul trucks would be on the road during the fall migration. However, this use would have an insignificant impact on the whooping crane because the road is parallel and next to East Gold Basin Road. In summary, remedial action activities would not affect the whooping crane.

The white-faced ibis is a Federal candidate species that breeds in colonies in freshwater marshes from eastern Oregon sporadically across to North Dakota and south into parts of Kansas and Colorado. It winters in the southwestern United States and Mexico. The marshes are typically dominated by tule (Scirpus sp.), cattail, and reed. The ibis feeds in areas with extensive marshes, ponds, or rivers and is known to fly long distances from its nest or roost site to feed in marshes and pools, along rivers and streams, and in irrigated fields (Armbruster, 1983). In western Colorado, the white-faced ibis occurs as an uncommon to common migrant in aquatic and agricultural habitats (Kingery and Graul, 1978). This species was not observed near the tailings site or in the wetland areas along Tomichi Creek (TAC, 1990a, 1989, 1988, 1985). However, it has been observed in the wet meadow habitat along Tomichi Creek and it is believed to nest about three miles east of the Gunnison County Airport in the Tomichi Creek wetlands (Radovitch, 1990). Remedial action activities would not affect nesting ibis because the nesting area is three miles away. There would also be no effect on migrating birds due to the small amount of land impacted and the existing high level of human activity in the area.

The long-billed curlew is a Federal candidate species. The curlew breeds only in the western Great Plains and Great Basin (including much of Colorado). It winters in the extreme southwestern United States (Armbruster, 1983). In the Gunnison, Colorado, area the long-billed curlew occurs as an uncommon migrant in the grassland, marsh, and lake or reservoir habitats (Kingery and Graul, 1978). This species could occur in the wet meadow habitat along Tomichi Creek during migration. However, the long-billed curlew has not been observed during any biological surveys of the area (TAC, 1990a, 1989, 1988, 1985) and its use of the area would be very sporadic. For this reason, remedial action activities at the Gunnison site would not be expected to impact this species.

The snowy plover is a Federal candidate species. The major breeding grounds are in two areas; northern Texas, western Oklahoma, southeast New Mexico and Nevada, southeast California, and central Utah (NGS, 1983). In Colorado, there are confirmed breeding areas in the east-central part of the state and probable breeding areas in the south-central part of the state (Kingery and Graul, 1978). This species nests on beaches and barren flats along lakes and reservoirs. Appropriate breeding habitat does not occur at the Gunnison site although a few individuals may use the area during migration. It is expected that remedial action activities would not impact this species.

The Colorado squawfish is listed as endangered by the FWS and the state of Colorado. This fish is the largest minnow in North America, and its historical range included the Colorado River and all of the larger tributaries from Wyoming to the Gulf of California, such as the Gunnison River. The Colorado squawfish is now rare and limited to the upper Colorado River basin (Valdez et al., 1982). Although the Colorado squawfish was historically common in the Gunnison River, it began to decline in abundance in the 1950s and is now considered rare in the Gunnison River (Valdez et al., 1982). Remedial action activities would not

impact the Gunnison River and, therefore, would not directly impact the Colorado squawfish.

The bonytail and humpback chubs are listed as endangered by the FWS and the State of Colorado. Historically, these fishes have been found throughout the Colorado River basin in main river channels, and larger tributaries. The bonytail chub was most common in the open river area of large river channels, while the humpback chub was restricted to swift, deep water areas, mainly in canyons. Presently, the bonytail chub is found in Lake Mohave of the lower Colorado River basin and in Gray Canyon on the Green River. The humpback chub is found in the Grand Canyon of the lower Colorado River basin and in the upper Colorado River basin in Westwater Canyon to Ruby Canyon. They were found in 1981 and 1982 in the Green and lower Yampa Rivers. It is likely that the bonytail and humpback chubs were never common in the Gunnison River and probably do not occur in the river at this time (Valdez et al, 1982). Therefore, remedial action activities would not have a direct impact on these two species.

The razorback sucker, a Federally proposed endangered species, originally occupied 1500 miles of the Colorado River system. Its current distribution is limited to 600 miles, mostly in the upper river basin. The result of a survey done in 1982 found that all specimens of this species collected in the upper Colorado River were adults, which suggests a low reproductive rate. Although the habitat preference of this species has not been fully evaluated due to the small number of observations, it appears to prefer backwaters and gravel pits with little or no flow and silt bottoms (Valdez et al., 1982). Historically, the razorback sucker was abundant in most of the Gunnison River as recently as the 1950s. This species is now extremely rare in the Gunnison River and the likelihood of successful razorback reproduction in the river is low (Valdez et al., 1982). Remedial action activities at the Gunnison site would not directly affect the razorback sucker.

Remedial action activities may indirectly affect the fish species addressed above by depletion of water from the Colorado River basin. Due to water depletion and other factors contributing to habitat loss, the FWS has determined that an upper Colorado basin-wide jeopardy situation (which includes the Gunnison River basin) has existed for the Colorado squawfish, bonytail chub, and humpback chub since 1978 (FWS, 1987). Depletion of any water within the basin (which would include water required for the remedial action) could have a negative impact on these listed fish species and would result in a "may affect" determination by the FWS. This determination requires the initiation of a formal consultation with the FWS under Section 7 of the Endangered Species Act. According to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (FWS, 1987), water depletion subject to a "may affect" determination would require a one-time contribution to the FWS of 10 dollars per acre-foot of water used based on the average annual project depletion. Water used for remedial action would be obtained from the shallow alluvial aquifer at the Gunnison processing site and from the deep alluvial aquifer at the Landfill disposal site. These aquifers are not hydrologically confined and water use from them may result in a net depletion of water from the upper Colorado River Basin system and may be subject to a one-time conservation fund payment to the FWS. Approximately 105 million gallons of water would be required for remedial action over the three-year period, or about 107 acre-feet per year. This average annual depletion of 107 acre-feet would be subject to the 10 dollar per acre-foot charge.

The skiff milkvetch is a Federal candidate species and occurs in open sagebrush areas on steep southeast to southwest slopes with thin rocky soil (Peterson et al., 1981). The skiff milkvetch was first collected in 1945 (Barneby, 1949). Recent surveys for this species indicate that it occurs along two drainages south of Gunnison: South Beaver Creek and a nearby unnamed drainage (Anderson, 1985). There are 11 known locations of this species, all in Gunnison County; the nearest location to the Landfill disposal site is eight miles east (O'Kane, 1985). The Landfill disposal site area does not appear to be appropriate for this species since it is relatively flat and does not have thin, rocky soils. However, since known populations of this species are located within a few miles of the Landfill disposal site, a survey for this species was conducted at the disposal site, borrow sites, and Tenderfoot Mountain haul route route. No skiff milkvetch were observed during these surveys (Carlson, 1989). Therefore, remedial action activities would not affect the skiff milkvetch.

The Gunnison milkvetch is endemic to the Gunnison Basin and was once common in the sagebrush plant community, especially in the South Beaver Creek and Gold Basin Creek drainages (Barrell, 1969). The species is now considered rare and is a Federal candidate species (Anderson, 1990). The Gunnison milkvetch was observed growing on the Gunnison tailings pile in 1986 (EES, 1986). Observations in 1990 found a small population of between 50 to 75 plants growing on the western edge of the pile among some sagebrush and other native plant species (TAC, 1990a) (Figure 3.1). Surveys in 1991 located only two plants. Surveys at the Landfill disposal site, Sixmile Lane and Chance Gulch borrow sites, and along the Tenderfoot Mountain haul road failed to result in the observation of the Gunnison milkvetch (EES, 1991; TAC, 1990a; Carlson, 1989).

Remedial action activities would impact the Gunnison milkvetch in that the population growing on the tailings pile would be eliminated. This impact cannot be avoided because the stabilization of the tailings at the Gunnison and other site is mandated by Congress. To mitigate the effects of remedial action, seeds of this species were collected in 1990 and will be used to establish a population at the processing site or at some other location.

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APPENDIX A

U.S. FISH AND WILDLIFE SERVICE LETTERS

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES OFFICE
1406 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138-1197

IN REPLY REFER TO:

July 24, 1984

Mr. Dave Lechel, Manager
Environmental Services
Jacobs Engineering Group INC.
5301 Central Avenue N.E. Suite 1700
Albuquerque, NM 87108

Dear Mr. Lechel:

We received your letter dated July 3, 1984, requesting a list of threatened or endangered species that may be present in areas being reviewed for remedial action of the Gunnison, Colorado uranium tailings. We are furnishing you the following list of species which may be present in the concerned area:

Listed Species

bald eagle	Haliaeetus leucocephalus

Candidate Species

skiff milkvetch	Astragalus microsymbus

We wish to make clear that the lead Federal agency has no legal requirement to protect candidate species, but it is within the spirit of the Endangered Species Act to consider these species in your project planning. Also, consideration of these species may reduce the likelihood that your project will be delayed unnecessarily if one or more candidate or proposed species is suddenly listed. However, our primary purpose for informing you of the possible presence of candidate species is to allow you to take conservation measures if you so desire.

Should you require additional information, the Fish and Wildlife Service contact for this study is Bob Leachman of our Grand Junction office (telephone: (303) 243-2778).

Thank you for your interest in conserving endangered species.

Sincerely,

Robert Benton

for Fred L. Bolwahnn
Field Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
COLORADO STATE OFFICE
529 25½ Road, Suite B-113
GRAND JUNCTION, COLORADO 81505
(303) 243-2778

IN REPLY REFER TO:

TAKE PRIDE IN AMERICA

(FWE) April 12, 1988

Mr. Bill Glover, Manager
Environmental Services Group
Jacobs Engineering Inc.
5301 Central Avenue N.E. Suite 1700
Albuquerque, NM 87108

Dear Mr. Glover:

We received your letter dated March 17, 1988, requesting a list of threatened or endangered species that may be present in new alternate disposal sites and a new borrow area being reviewed for remedial action of the Gunnison, Colorado uranium tailings. We are furnishing you the following list of species which may be present in the concerned area:

Listed Species

Bald eagle	Haliaeetus leucocephalus
Black-footed ferret	Mustela nigripes

Bald eagles are common winter visitors in the Gunnison Basin. Bald eagles are known to fly up to 18 miles from night roosts to feeding areas and it is likely that even greater distances are traveled searching for food. The species may therefore occur in the project area.

Historically, the black-footed ferret may have occurred in portions of the Gunnison Basin area. Literature documents a close association between prairie dogs and black-footed ferrets. Your pre-construction surveys should determine whether your activities will disturb prairie dog colonies. If so, black-footed ferret surveys may be required.

The skiff milkvetch (Astragalus microcymbus) is a candidate for official listing as a threatened or endangered species (Federal Register Vol. 50, No. 188, September 27, 1985). While this species presently has no legal protection under the Endangered Species Act, it is within the spirit of the Act to consider project impacts to this potentially sensitive candidate species.

The Service does not have any site specific wetland information for the project area. However, we are aware of wetlands in the vicinity of the current uranium mill tailings site. Therefore, we request that all sites proposed for disturbance (current tailings site, proposed borrow sites, and proposed disposal sites) be inventoried for wetlands. Wetlands should be defined according to "Classification of Wetlands and Deepwater Habitats of the United

States" (Cowardin, et al, 1977). We recommend project planning incorporate avoidance of wetland impacts.

The Fish and Wildlife Service can enter into formal Section 7 consultation only with another Federal agency or its designee. State, county, or other governmental or private organizations can participate in the consultation process, help prepare information such as the biological assessment, participate in meetings, etc.

Should you require additional information, the Fish and Wildlife Service, contact for study is John Anderson.

Thank you for your interest in conserving endangered species.

Sincerely,

Richard P. Krueger

FOR Jeffrey D. Opdycke
State Supervisor

cc: FWS/FWE: SLC
Official file
Reading file

JANDERSON:cjharris
Gunnu

APPENDIX B

U.S. FISH AND WILDLIFE SERVICE BIOLOGICAL OPINION

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
Western Colorado Sub-Office
529 25½ Road, Suite B-113
Grand Junction, CO 81505-6199
FTS 332-0351
COMM (303) 243-2778

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
FWE/GJ-6-CO-90-F-12

December 11, 1990

Mr. Mark L. Matthews
Project Manager
Uranium Mill Tailings Remedial Action Project Office
Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, NM 87115

Subject: Biological Opinion Regarding Remedial Action at the Gunnison, Colorado, Uranium Mill Tailings Site

This responds to your October 1, 1990, letter initiating Section 7 consultation under the Endangered Species Act of 1973, as amended. The Fish and Wildlife Service (Service) has reviewed your biological assessment and concurs with your "may affect" determination for Colorado squawfish (Ptychocheilus lucius), humpback chub (Gila cypha), and bonytail chub (Gila elegans), which are all federally listed as endangered. The fourth species addressed in your biological assessment, the razorback sucker (Xyrauchen texanus) is currently proposed for listing as endangered. It is the Department of Energy's (DOE) responsibility to confer with the Service on any action which is likely to jeopardize the continued existence of any proposed species (50 CFR Part 402.10). Your biological assessment made the determination that the proposed action "may affect" the razorback sucker; however, the regulations require that the DOE determine whether the proposed action is likely to jeopardize the continued existence of the razorback sucker. Please submit your determination to this office for our concurrence.

We concur with your assessment that the proposed action would not affect the bald eagle (Haliaeetus leucocephalus), black-footed ferret (Mustela nigripes) or whooping crane (Grus americana). We appreciate your concern with the other candidate species and applaud your proposals to preserve and protect those species as outlined in your biological assessment.

This biological opinion addresses impacts of the proposal to Colorado squawfish, humpback chub, and bonytail chub. This opinion has been prepared in accordance with Section 7 of the Endangered Species Act (16 U.S.C. 1531 et seq.) and the Interagency Cooperation Regulations (50 CFR 402).

Biological Opinion

The depletion of 88 acre-feet of water from the Colorado River basin for the remedial action at the Gunnison disposal site, with the inclusion of the Conservation Measures outlined below, is not likely to jeopardize the continued existence of the Colorado squawfish, humpback chub, or bonytail chub.

Project Description

The DOE proposes to consolidate contaminated uranium mill tailings which are associated with uranium milling activities which occurred adjacent to the city of Gunnison, Colorado. These tailings and associated contaminated soil, over 800,000 cubic yards, would be disposed of in an approved contaminant area. DOE estimates 88 acre-feet per year of water will be needed to conduct this remedial action.

Basis for Opinion

Water depletions in the Upper Colorado River Basin have been recognized as a major source of impact to endangered fish species. Continued water withdrawal has restricted the ability of the Colorado River system to produce flow conditions required by various life stages of the fish. Impoundments and diversions have reduced peak discharges by 50 percent since 1942 while increasing flows by 21 percent in some reaches. These depletions along with a number of other factors have resulted in such drastic reductions in the populations of Colorado squawfish, humpback chub and bonytail chub that the Service has listed these species as endangered and has implemented programs to prevent them from becoming extinct.

COLORADO SQUAWFISH

The Colorado squawfish evolved as the main predator in the Colorado River system. The diet of Colorado squawfish longer than three or four inches consists almost entirely of other fishes (Vanicek and Kramer 1969). The Colorado squawfish is the largest cyprinid fish (minnow family) native to North America and, during pre-development times, may have grown as large as six feet in length and weighed nearly 100 pounds (Behnke and Benson 1983). These large fish may have been 25-50 years of age.

Based on early fish collection records, archaeological finds and other observations, the Colorado squawfish was once found throughout warm water reaches of the entire Colorado River Basin, including reaches of the upper Colorado River and its major tributaries, the Green River and its major tributaries, and the Gila River system in Arizona (Seethaler 1978). Colorado squawfish were apparently never found in colder, headwater areas. Seethaler (1978) indicates that the species was abundant in suitable habitat throughout the entire Colorado River basin prior to the 1850's. Historically, Colorado squawfish have been collected in the upper Colorado River as far upstream as Parachute Creek, Colorado (Kidd 1977).

A marked decline in Colorado squawfish populations can be closely correlated with the construction of dams and reservoirs during the 1960's, the introduction of nonnative fishes, and the removal of water from the Colorado River system. Behnke and Benson (1983) summarized the decline of the natural ecosystem. They pointed out that dams, impoundments, and water use practices are probably the major reasons for drastically modified natural river flows and channel characteristics in the Colorado River Basin. Dams on the mainstem have essentially segmented the river system, blocking Colorado squawfish spawning migrations and drastically changing river characteristics, especially flows and temperatures. In addition, major changes in species composition have occurred due to the introduction of nonnative fishes, many of which have thrived as a result of changes in the natural riverine system (i.e., flow and temperature regimes). The decline of endemic Colorado River fishes seems to be at least partially related to competition or other behavioral interactions with nonnative species, which have perhaps been exacerbated by alterations in the natural fluvial environment.

The Colorado squawfish currently occupies about 1,030 river miles in the Colorado River system (25 percent of its original range) and is presently found only in the upper Colorado River Basin above Glen Canyon Dam. It inhabits about 350 miles of the mainstem Green River from its mouth to the mouth of the Yampa River. Its range also extends 140 miles up the Yampa River and 104 miles up the White River, the two major tributaries of the Green River. In the mainstem Colorado River, it is currently found from Lake Powell extending about 201 miles upstream to Palisade, Colorado, and in the lower 33 miles of the Gunnison River, a tributary to the mainstem Colorado River (Tyus et al. 1982). Recent investigation found adult Colorado squawfish inhabit the San Juan River as far upstream as 163.3 miles above Lake Powell.

The life stages that appear to be most critical are from egg fertilization through its first year of life. It has been demonstrated that these phases of Colorado squawfish development are also closely tied to some specific habitat requirements. It is imperative that proper flows and temperatures are provided during these essential life stages. The conservation measures outlined below will help further investigate and meet the habitat

requirements of the Colorado squawfish, thus offsetting project-related impacts and the likelihood of jeopardy for the species.

HUMPBACK CHUB

Humpback chub generally do not make migrational movements in the upper Colorado River and tend to reside throughout the year within a limited reach of river. Humpback chub are found inhabiting narrow, deep canyon areas, and are relatively restricted in distribution. They seldom leave their canyon habitat (Service 1982). While humpback chub are still occasionally found dispersed in the Green and Yampa Rivers, the only major populations of humpback chub known to exist in the upper Colorado River basin are located in Black Rocks and Westwater Canyons on the Colorado River. Conservation measures outlined below will contribute to providing proper habitat conditions for humpback chub, thus offsetting the likelihood of jeopardy for the species.

BONYTAIL CHUB

Little is known about the biological requirements of the bonytail chub, as the species greatly declined in numbers in the upper basin shortly after 1960. Until recently, the Service considered the species extirpated from the upper basin; however, a recently collected specimen which exhibits many bonytail characteristics could indicate a small, extant population. It is thought that, should this species persist in the Colorado River, the preferred habitat would be larger river reaches in the Colorado River. Conservation measures outlined below will contribute to conservation efforts for the bonytail chub, thus offsetting the likelihood of jeopardy for the species.

Conservation Measures

On January 21-22, 1988, the Secretary of the Interior, the governors of Wyoming, Colorado, and Utah, and the Administrator of the Western Area Power Administration were cosigners of a Cooperative Agreement to implement the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (Recovery Program). An objective of the Recovery Program was to identify reasonable and prudent alternatives that would ensure the survival and recovery of the listed species while providing for new water development in the Upper Colorado River Basin.

The following excerpts are pertinent to the consultation because they summarize portions of the Recovery Program that address depletion impacts, Section 7 consultation, and project proponent responsibilities:

> "All future Section 7 consultations completed after approval and implementation of this program (establishment of the Implementation Committee, provision of congressional funding, and initiation of the elements) will result in a one-time contribution to be paid to the Service by water project proponents in the amount of $10.91 per acre-foot based on the average annual depletion of the project.... This figure will be adjusted annually for inflation.... Concurrently with the completion of the Federal action which initiated the consultation, e.g., ...issuance of a 404 permit, 10 percent of the total contribution will be provided. The balance...will be...due at the time the construction commences...."

It is important to note that these provisions of the Recovery Program were based on appropriate legal protection of the instream flow needs of the endangered Colorado River fishes. The Recovery Program further states:

> "...it is necessary to protect and manage sufficient habitat to support self-sustaining populations of these species. One way to accomplish this is to provide long term protection of the habitat by acquiring or appropriating water rights to ensure instream flows.... Since this program sets in place a mechanism and a commitment to assure that the instream flows are protected under State law, the Service will consider these elements under Section 7 consultation as offsetting project depletion impacts."

Thus, the Service has determined that project depletion impacts, which the Service has consistently maintained are likely to jeopardize the listed fishes, can be offset by (a) the water project proponents one-time contribution to the Recovery Program in the amount of $10.91 per acre-foot of the project's average annual depletion, and (b) appropriate legal protection of instream flows pursuant to State law. The Service believes it is essential that protection of instream flows proceed expeditiously, before significant water depletions occur.

With respect to (a) above (i.e., depletion charge), the applicant will make a one-time payment which has been calculated by multiplying the project's average annual depletion (88 acre-feet) by the depletion charge in effect at the time payment is made. For fiscal year 1991 (October 1, 1990, to September 30, 1991), the depletion charge is $10.91 per acre-foot of the average annual depletion which equals a total payment of $960.08 for this project. This amount will be adjusted annually for inflation on October 1 of each year based on the previous year's Composite Consumer Price Index. The Service will

notify the DOE of any change in the depletion charge by September 1 of each year. Ten percent of the total contribution ($96.01) or total payment, will be made to the National Fish and Wildlife Foundation (see Appendix A). The balance will be due at the time the construction commences. Fifty percent of the funds will be used for acquisition of water rights to meet the instream flow needs of the endangered fishes (unless otherwise recommended by the Implementation Committee); the balance will be used to support other recovery activities for the Colorado River endangered fishes.

Conclusion

This concludes our biological opinion on the impacts of proposed remedial action. This opinion was based upon the information described herein. If new information becomes available, new species listed, or should there be any changes in the total average annual amount of water depleted by this project (88 acre-feet per year) or any other project change which alters the operation of the project from that which is described in the biological assessment and which may affect any endangered or threatened species in a manner or to an extent not considered in this biological opinion (see 50 CFR 402.16), formal Section 7 consultation should be re-initiated. Section 7 consultation must also be re-initiated if there is failure to carry out the Conservation Measures upon which this opinion was based.

Thank you for your interest in conserving endangered species.

Sincerely,

Keith L. Rose
Acting Colorado State Supervisor

Attachment (Appendix A)

cc (without attachment):
CDOW, Grand Junction
EPA, Denver
FWS/FWE, Denver
FWS/FWE, Grand Junction
FWS/FWE, Salt Lake City
FWS/FWE, Washington, D.C.

REFERENCES

Behnke, R.J., and D.E. Benson. 1983. Endangered and threatened fishes of the Upper Colorado River Basin. Ext. Serv. Bull. 503A, Colorado State University, Fort Collins, CO. 38 pp.

Kidd, G. 1977. An investigation of endangered and threatened fish species in upper Colorado River as related to Bureau of Reclamation Projects. Final report, Bureau of Reclamation, Salt Lake City. 36 pp.

Seethaler, K. 1978. Life History and Ecology of the Colorado Squawfish (Ptychocheilus lucius) in the upper Colorado River basin. Thesis, Utah State University, Logan, Utah.

Tyus, H.M., B.D. Burdick, R.A. Valdez, C.M. Haynes, T.A. Lytle, and C.R. Berry. 1982. Fishes of the Upper Colorado River Basin: Distribution, abundance and status. pp. 12-70. In: Miller, W.H., H.M. Tyus and C.A. Carlson, (eds) 1982. Fishes of the Upper Colorado River System: Present and Future. Western Division, American Fisheries Society, Bethesda, MD.

U.S. Fish and Wildlife Service. 1982. Colorado River Fishery Project Final Report. Part I (42 pp), Part II (356 pp), and Part III (342 pp). Prepared for the U.S. Bureau of Reclamation, Salt Lake City. April 1982.

U.S. Fish and Wildlife Service, 1987. Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver, Colorado. 82 pp.

Vanicek, C.D., and R.H. Kramer. 1969. Life history of the Colorado squawfish Ptychocheilus lucius and the Colorado chub Gila robusta in the Green River in Dinosaur National Monument, 1964-1966. Trans. AFS 98(2):193

APPENDIX A

Cooperative Agreement between U.S. Department of the Interior Fish and Wildlife Service and National Fish and Wildlife Foundation

I. Background

Three species of fish that inhabit the Colorado River system have been federally listed as endangered: the Colorado squawfish, humpback chub, and bonytail chub. A fourth, the razorback sucker, is currently a candidate for listing. On January 21-22, 1988, the Governors of Utah, Wyoming, and Colorado, the Administrator of the Western Area Power Administration, and the Secretary of the Interior executed a Cooperative Agreement to implement the "Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin" (Recovery Program). The 15-year Recovery Program outlines an aggressive effort to recover the endangered fishes of the Colorado River in a manner that is consistent with Interstate Compacts and State water rights systems. The signing of the Cooperative Agreement also established an Implementation Committee whose purpose is to oversee the Fish and Wildlife Service's (Service) implementation of the Recovery Program. Members of the Implementation Committee include representatives of the States of Colorado, Wyoming, and Utah, the Service, the Bureau of Reclamation, the Western Area Power Administration, and representatives of the water development interests and environmental groups.

The cost for implementing the Recovery Program is estimated at $58.5 million over the 15-year time frame. Contributions by proponents of water projects (Federal, State and private) are expected to provide approximately $9-10 million of these funds, assuming full Compact development over the next 15 years. Water project proponents will make a one-time contribution to the Service in the amount of $10 per acre-foot based on the average annual depletion of projects that complete consultation pursuant to Section 7(a)2 of the Endangered Species Act of 1973, as amended. Payment of the contribution will be specified in the biological opinion for each water project which causes a depletion of water from the Upper Colorado River system. Ten percent of the funds will be payable upon completion of the Federal action which initiated the consultation (e.g., issuance of a 404 permit); the balance will be due at the time construction commences or prior to the depletion becoming effective. Funds from these contributions are to be applied equally to flow acquisition and other priority recovery activities, unless otherwise directed by the Implementation Committee.

In addition, the Recovery Program has a provision for the donation of funds from private parties, including conservation groups. Private donations would be used for priority recovery activities as agreed to by the donor, the Service, and/or the Implementation Committee.

The role of the National Fish and Wildlife Foundation (Foundation) was identified in the Recovery Program. Section 5.5 indicates that all contributed or donated funds accruing from the Recovery Program, regardless of source, will be placed in an interest bearing account, such as those administered by the Foundation, until such time as they are utilized in accordance with the Implementation Committee's approved annual work plan and budget.

II. Purpose and Objectives

The purpose of this Cooperative Agreement is to establish a mechanism and procedures for (1) the transfer of funds contributed by water project proponents and private donors pursuant to the Recovery Program to the Foundation; and (2) the disbursement of said funds from the Foundation to accomplish Colorado River fishes recovery activities. This Cooperative Agreement will facilitate the accomplishment of recovery activities for the rare Colorado River fishes in an efficient and timely manner.

III. Authorities

Fish and Wildlife Coordination Act, 16 U.S.C. Sec. 661;
Fish and Wildlife Act of 1956, 16 U.S.C. Sec. 742f(a)(4); and
National Fish and Wildlife Foundation Establishment Act, 16 U.S.C. Sec. 3703(c)(6).

IV. Term

This Agreement shall take effect upon execution, with only subsequent contributed and donated funds being transferred to the Foundation, and will remain in effect until completion or termination of the Recovery Program, whichever occurs first. The term of the Cooperative Agreement that implements the Recovery Program is 15 years.

V. Specific Obligations of the Parties

To accomplish the purposes and objectives of this Cooperative Agreement, each party agrees to cooperate with the other to fulfill its obligations as herein provided.

A. Service Obligations - The Service will:

1. When this Agreement takes effect, inform water project proponents and potential private donors of the procedures for contributing funds to the Foundation, pursuant to the Recovery Program. Procedures for payment of the contributed funds will be specified in the Biological Opinion for each water project which causes a depletion of water from the Upper Colorado River system, and the Service is responsible for ensuring that private and State water project proponents make payment to the Foundation.

2. Identify, from the list of projects included in the Implementation Committee's approved annual work plan, those that should be funded by the Foundation with Colorado River contributed and donated funds. Use of these funds will be coordinated by the Service, on behalf of the Implementation Committee, with the Foundation. (Attachment 1 identifies the current process and schedule for development of the annual work plan by the Implementation Committee.)

3. Develop, in coordination with the Implementation Committee, requests-for-proposals and/or scopes-of-work for work to be funded with Colorado River contributed/donated funds.

4. Work closely with the Foundation to develop contracts for work to be funded with Colorado River contributed/donated funds.

5. Appoint a technical project officer for all contracts or projects carried out or funded under this Agreement.

6. Appoint an individual who will represent the Service in carrying out its obligations under this Agreement, including authorizing the expenditure of funds by the Foundation.

7. In cases dealing with disbursement of funds for acquiring water rights, provide the Foundation with written direction of the Service's Director or his designee, and a certified resolution of the Implementation Committee recommending allocation of the funds. The resolution will contain the following information:

   a. The specific purpose for which the funds are being disbursed.
   b. A detailed description of the water right to be acquired.
   c. The owner of the water right.
   d. The exact or maximum amount to be expended in acquiring the water right.

8. Coordinate and report upon activities of the Foundation with and to the Colorado River Implementation Committee, including providing an annual accounting to the Implementation Committee for all funds maintained, received, and/or expended pursuant to this Agreement.

9. Continue to maintain separate accounts for funds appropriated by Congress for the acquisition of water rights, and contributed/donated funds received prior to the implementation of this Agreement. Use of funds in these accounts will be coordinated by the Service, on behalf of the Implementation Committee, with those maintained by the Foundation under this Agreement.

B. Foundation Obligations - The Foundation will:

1. Serve as the Service's designated agent for accepting and administering contributed and donated funds acquired pursuant to the Recovery Program, and disbursing these funds as approved by the Service and the Implementation Committee.

2. Maintain these funds in a specific account, separate from other Foundation accounts. Interest accruing to this Foundation account will be used for the purpose for which the account was established.

3. Develop and/or issue, in coordination with the Service, contracts for work to be funded with Colorado River contributed/donated funds as identified in the approved Implementation Committee work plan.

4. Appoint an individual who will represent the Foundation in carrying out its obligations under this Agreement.

5. Solicit and accept private donations to finance and implement recovery activities, including the acquisition of water rights, pursuant to the Recovery Program. This obligation is contingent upon approval of the Foundation's Board of Directors and the Service, and is separate from Congressional appropriations coming to the Service for acquisition of water rights.

6. Appoint a technical project officer for all contracts or projects carried out or funded under this Agreement.

VI. Financial Administration

1. The Foundation will be reimbursed for actual expenses associated with carrying out its obligations under this Agreement (not to exceed two percent of the funds received each year). The Foundation will provide a quarterly statement which itemizes its expenses. Upon review (which will not exceed 30 days), the Service will authorize the Foundation to debit the contributed fund account to reimburse approved expenses.

2. The Foundation will prepare and submit to the Service a semiannual report by July 15 and December 15 of each year, which itemizes all funds maintained, deposited, accrued, and disbursed from the account established pursuant to this Agreement.

VII. Project Officers

For the Service (and on behalf of the Implementation Committee):

John Hamill, Program Director
Colorado River Endangered
Fishes Recovery Program
U.S. Fish and Wildlife Service
P.O. Box 25486, DFC
Denver, Colorado 80225
(303) 236-7398, FTS 776-7398

For the Foundation:

Whitney Tilt
Project Manager
National Fish and Wildlife
Foundation
18th & C Streets, NW, Rm 2725
Washington, D.C. 20240
(202) 343-1040, FTS 343-1040

VIII. Special Terms and Conditions

1. The Foundation will, in coordination with the Service, select the most appropriate investment option for the contributed/donated funds. Primary consideration will be given to selecting extremely safe investments with the highest possible yield. Interest and/or dividends accruing to the account shall be available for the purposes for which the funds were contributed or donated.

2. Funds may be dispersed by the Foundation for purposes not included in the Implementation Committee's annual work plan at the written direction of the Service's designated representative for this Agreement and concurrence of the Chairman of the Implementation Committee.

IX. Amendments

Amendments to this Agreement may be proposed by either party, and shall become effective only upon being reduced to a written instrument executed by both parties.

X. Termination

This Agreement may be terminated by either party upon 90 days written notice to the other. Upon receipt of such written notice, the Foundation will provide an accounting of remaining funds and outstanding contractual obligations of funds. In the case of termination, the Service will make arrangements for transferring the funds administered by the Foundation to another entity, or renegotiate an alternative agreement with the Foundation.

XI. General Provisions

The U.S. Fish and Wildlife Service General Provisions for Grant and Cooperative Agreements, as attached, shall be applicable to this Agreement.

In witness whereof, each party has caused this Agreement to be executed by an authorized official on the day and year set forth below their signature.

National Fish and Wildlife Foundation

BY _____

TITLE Executive Director

DATE 5/17/89

U.S. Fish and Wildlife Service

BY _____
GALEN L. BUTERBAUGH

TITLE Regional Director

DATE JUN 14 1989

Process and Schedule
Colorado River Endangered Fishes
Annual Work Plan

December 31	Each Principal Investigator provides a written summary of results of studies and identifies successes, shortcomings and plans for the next year. An oral presentation is provided at the Colorado River annual researcher's meeting in February.
March 15	Chairman of Technical Group sends out a request for preliminary proposals for new projects.
June 15	Technical Group meets to rank existing (ongoing) projects and preliminary proposals for new projects. Each project is ranked based on several factors, including: a. consistency with the Recovery Program/Plans b. degree of urgency (to avoid jeopardy) c. essential for recovery d. timeliness of study results e. likelihood of success f. relationship to other priority work g. opportunity to do project now h. quality of proposal Recommendations are provided to the Management Group on the relative priority of funding existing and new (proposed) projects.
July 15	Management Group considers the recommendations of the Technical Group, determines available funding, and prepares draft work plan. Management Group transmits a draft work plan to Implementation Committee for review.
September 1	Implementation Committee meets to review and approve the annual work plan.
Sept-Dec	Cooperators develop and/or issue requests for proposals, scopes-of-work, and contracts for projects approved in the Implementation Committee's work plan.
January 31	Implementation Committee meets to review the status of projects contained in their annual work plan.

Department of Energy
Albuquerque Operations Office
P.O. Box 5400
Albuquerque, New Mexico 87115

FEB 0 7 1991

Mr. Keith L. Rose
Acting Colorado State Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
529 25 1/2 Road, Suite B-113
Grand Junction, CO 81505-6199

Dear Mr. Rose:

The purpose of this letter is to expand on the threatened and endangered (T&E) species issue at the U.S. Department of Energy's (DOE) Gunnison Uranium Mill Tailings Remedial Action (UMTRA) Project near Gunnison, Colorado. On October 1, 1990, an environmental assessment (EA), which addressed the environmental impacts of remediating the Gunnison UMTRA site, was sent to the U.S. Fish and Wildlife Service (FWS) for review. A biological assessment which addressed T&E species at this site was attached to this EA. On December 11, 1990, the UMTRA Project Office received the FWS's biological opinion regarding the Gunnison UMTRA site. In that opinion, it was stated the DOE must make a determination whether the proposed action is likely to jeopardize the continued existence of the razorback sucker. This letter will serve as DOE's determination regarding the razorback sucker.

The proposed action and ecological setting of the Gunnison UMTRA Project site are provided in the above referenced biological assessment. To summarize, the proposed action is to relocate the uranium mill tailings and other contaminated material to a disposal site approximately six air miles from the Gunnison site. Remedial action would take place over a three year period.

The Gunnison UMTRA site and disposal site are in the Great Basin sagebrush habitat. As stated in the biological assessment, consultation with the FWS identified six endangered, one proposed, and five candidate species that had the potential of existing at and near the UMTRA Project site. As indicated in the biological assessment, it is very unlikely that the razorback sucker presently inhabits the Gunnison River, so remedial action at the Gunnison UMTRA site would not directly impact this species. However, remedial action may indirectly affect the razorback sucker due to depletion of water from the Upper Colorado River Basin. The FWS has determined that an Upper Colorado River Basin-wide jeopardy situation has existed for the endangered Colorado squawfish, bonytail chub, and humpback chub since 1978, and that depletion of water from the Upper Colorado River Basin may affect the continued existence of these species. It was further determined that remedial action at the Gunnison UMTRA Project site may affect the Colorado squawfish, humpback chub, and bonytail chub due to water depletion, and that a one-time payment to the FWS for this depletion would serve as mitigation. This assessment was agreed with by the FWS in their December 11, 1990, biological opinion.

It is the position of the DOE that the conservation measure taken for the endangered fish species listed above (i.e. payment of a fee to the FWS) will also serve as mitigation for the razorback sucker. Therefore, remedial action activities at the Gunnison UMTRA Project site will not jeopardize the continued existence of the razorback sucker.

We appreciate the opportunity to work with you regarding the conservation of T&E species. Thank you for supporting our efforts to dispose of the uranium mill tailings at the Gunnison UMTRA Project site in an environmentally sound manner. Should you have any questions, call Steve Hamp of my staff at (505) 845-5640.

Sincerely,

Mark L. Matthews
Project Manager
Uranium Mill Tailings Remedial Action
Project Office

cc:
D. Leske, UMTRA
S. Beranich, JEG
C. Bury, JEG
B. Glover, JEG
J. McBee, JEG

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
Western Colorado Sub-Office
529 25½ Road, Suite B-113
Grand Junction, CO 81505-6199
FTS 332-0351
PHONE: (303) 243-2778
FAX: (303) 245-6933

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
FWE/CO:DOE:UMTRA
Mail Stop 65412 Grand Junction

February 25, 1991

Mark L. Matthews, Project Manager
Uranium Mill Tailings Remedial Action Project
Department of Energy
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Matthews:

This responds to your three letters dated February 7, 1991, regrading remedial action activities at the Gunnison, Maybell, and Naturita Uranium Mill Tailings sites.

Each of the above letters serve as a biological assessment for the razorback sucker (proposed for Federal listing on May 22, 1990), as required under Section 402.12 of 50 CFR 402. We concur with your conclusion that remedial action activity at each of the sites is not likely to jeopardize the continued existence of the razorback sucker. Further action under Section 7 of the Endangered Species Act is, therefore, not necessary for any of the above projects.

We appreciate your attention to endangered species issues. Please contact me if there are any questions.

Sincerely,

Keith L. Rose
Acting Colorado State Supervisor

cc: FWS/FWE, Golden
FWS/FWE, Salt Lake City
CDOW, Grand Junction
CDOW, Montrose